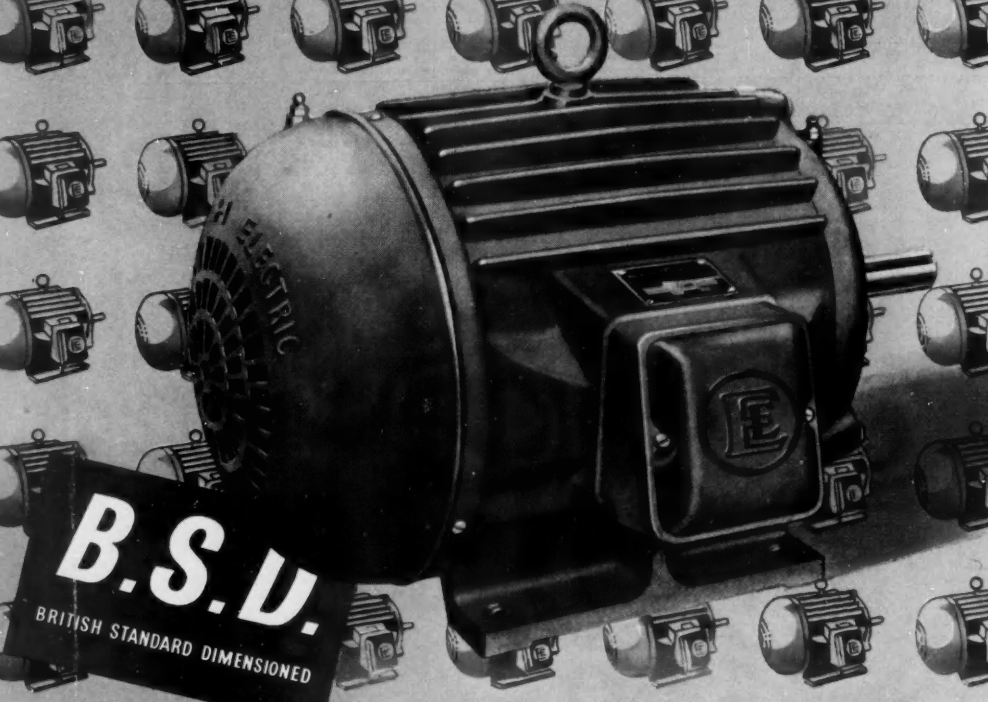
8 APRIL 1954 NINEPENCE

ELECTRICAL TIMES

THOUSANDS OF 'ENGLISH ELECTRIC' CLASS 'LY'
BRITISH STANDARD MOTORS ALREADY IN USE

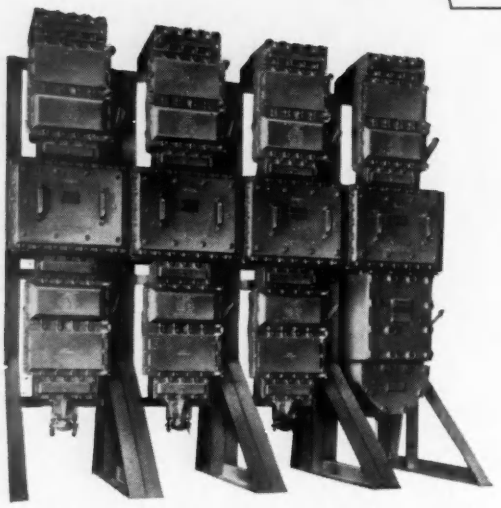


'ENGLISH ELECTRIC'
industrial motors

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2
Industrial Motor Works, Bradford
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON
BM.21

Simplex

Flameproof FLP Equipment



Here is a typical Simplex Flameproof switchgear panel as supplied to oil companies throughout the world. This panel has 300 amp, 500 volt T. P. & N. busbar chambers, 200 amp, 500 volt incoming T. P. & N. switch and seven 60 amp, 500 volt T. P. & N. outgoing switchfuses. This panel was supplied to E. B. Badger & Sons Ltd., of Parkgate Road, Battersea, for the Anglo-Iranian Oil Company's new refinery at Aden

UNIQUE

Supplied to:—

Aden Protectorate
Arabia
Assam
Australia
Belgium
Burma
Cyprus
England
East Africa
Egypt
France
Germany
Holland
India
Indonesia

UBIQUE

Iran
Iraq
Ireland
Italy
Kuwait
New Zealand
Pakistan
Palestine
Rhodesia
Scotland
South Africa
Sweden
Venezuela
Wales
West Indies

UNIQUE

Simplex offer the first and only Flameproof Handlamp (40-60 watt) ever to be granted a full Ministry of Fuel and Power Certificate (No. 3139, covering Groups II and III Gases). The handlamp—which can be supplied ready wired—is designed for use with a special cable and can be wired in conjunction with the Simplex Interlocking Switch Socket and Plug

UNIQUE

Simplex 15 amp Interlocking Switch Socket and Plug (AC only) complies with BS.229/46 and CP.1003 and has, of course, been granted a full Ministry of Fuel & Power Certificate (No. 2699 covering Group II Gases). The plug incorporates a special type of clamp allowing the use of screened cables. This prevents the cable being pulled out of the plug

Advisory Centre We will be very pleased to help solve any problems involving Flameproof equipment. Write to our Flameproof Equipment Advisory Centre, Broadwell Works, Oldbury, Birmingham

flameproof equipment made by the House of **Simplex**

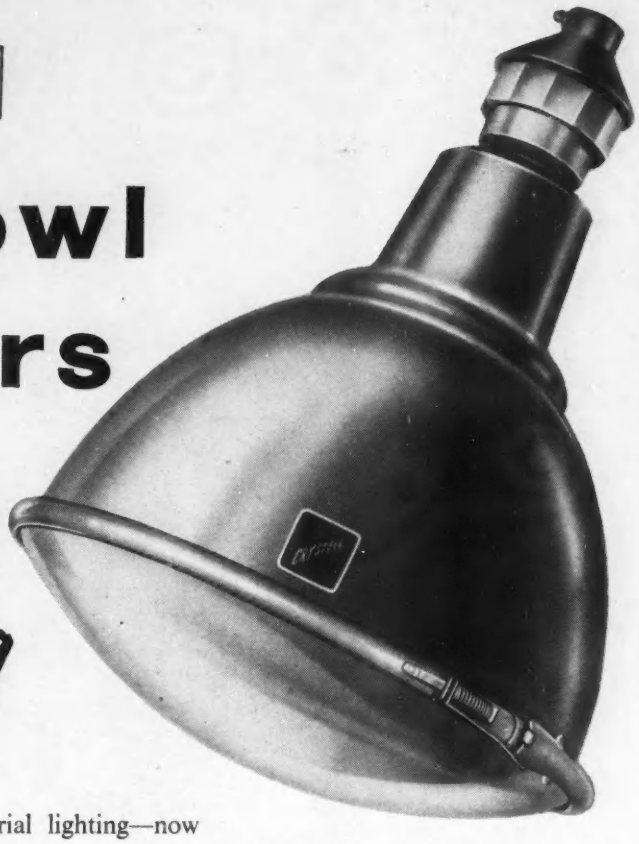
Simplex Electric Co Ltd Oldbury Birmingham & Branches

A TI COMPANY

BENJAMIN REGD.

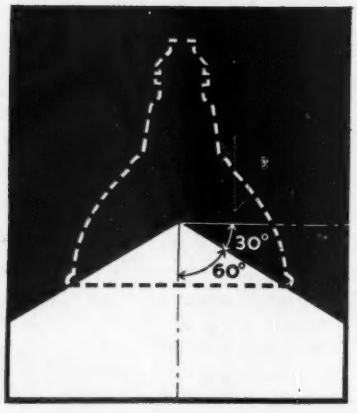
deep bowl reflectors

for Quality Lighting



Benjamin—renowned for quality in industrial lighting—now take a great step forward by introducing the Deep Bowl Reflector. Indeed, this is one of the major advances in quality lighting of modern times. By its increased depth, this reflector provides maximum comfort and clarity of vision.

The illustration shows the Deep Bowl Reflector with Heavy Duty Top and Dustproof Visor. These features should always be specified . . . and remember—first-class lighting demands first-class accessories! Benjamin give you all this and at practically the same cost.



The usual Benjamin 'quality' features, Crysteel Vitreous Enamel finish, Saaflux Temperature Reducing and easy maintenance, are incorporated.

Our local Engineer is always at your disposal, write or phone for full details

Better Lighting by

BENJAMIN REGD.

THE BENJAMIN ELECTRIC LTD., BRANTWOOD ROAD, TOTTENHAM, LONDON, N.17

Telephone: TOTtenham 5252 (5 lines) *Telegrams: "Benjalect, Southtot, London"*

BIRMINGHAM
5, CORPORATION STREET, BIRMINGHAM, 2 Telephone: Midland 5197

LEEDS
49, BASINGHALL STREET, LEEDS, 1 Telephone: Leeds 28578

Smee's 353

A

aluminium adventure

power climbs over A PASS

High above the steep sides of the Kemano valley, British Columbia, engineers handle aluminium cable, steel reinforced, 2.26 ins. in diameter — the largest ever made.

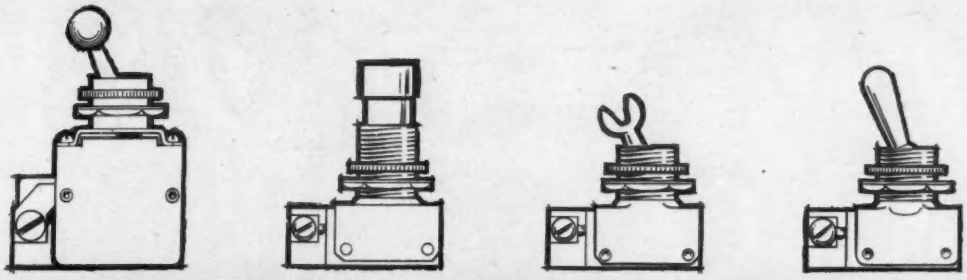
This unique transmission line, designed to withstand heavy icing loads, will carry the 300,000 volt output of the Kemano underground power station across fifty miles of rugged terrain and over the 5,300 ft. Kildala Pass. To mountain sites inaccessible to all other forms of transport, helicopters have flown-in materials and equipment for the transmission towers which will take the power over the pass to Kitimat.

There, on the shores of the Douglas Channel, the great new smelter of Aluminum Company of Canada Ltd. is rapidly taking shape. When fully developed it will be capable of producing 500,000 metric tons of aluminium a year, and will play an important part in making aluminium and its alloys ever more abundantly useful.

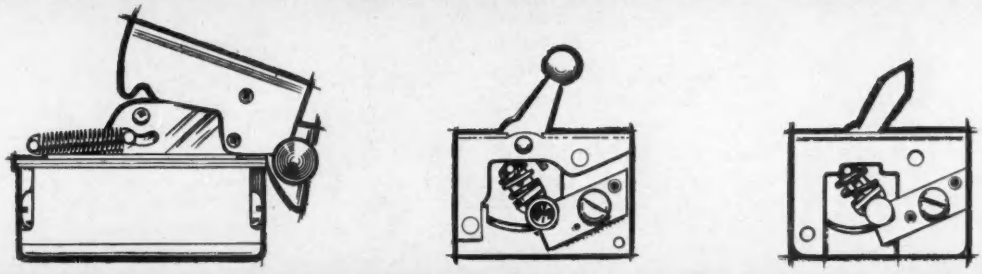
Aluminium Union Limited

(Incorporated in Canada)

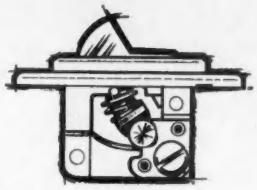
THE ADELPHI, STRAND, LONDON, W.C.2 AN ALUMINIUM LIMITED COMPANY
PRINCIPAL BRITISH COMMONWEALTH DISTRIBUTOR OF ALUMINIUM

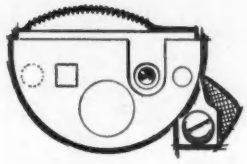


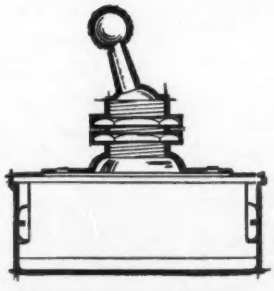
APPLIANCE



SWITCHES by







ARROW

The Arrow range of appliance switches is the largest and most complete offered by any British manufacturer. All are of original design, many of them unique, and they are readily acceptable in overseas markets.

To deal with a manufacturer who for over 60 years has made switches — and nothing but switches — offers advantages extending far beyond these important considerations. Quantity production ensures continuity of supply; quality of craftsmanship is backed by quality of materials; the maintenance of stringent standards is ensured by the most modern inspection methods. A realistic manufacturing policy in a highly competitive field, rivalled only by the essentially realistic nature of our prices . . .

SEND US YOUR SPECIFICATIONS

ARROW ELECTRIC SWITCHES LTD · HANGER LANE · LONDON · W.5

1912-1954

The Story of

BELLING & COMPANY LIMITED

NO. 25, APRIL 1954

In my last advertisement, which appeared about this time last year, I ended by saying I hoped to have "something more interesting" to talk about this year.

Well, first of all I must tell you our production and sales have broken all records and they are, in fact, more than 50% above our previous record year. This, of course, is an astonishing result and reflects the keenness and hard work of everybody down here, combined with the wholehearted support of the electrical industry generally. I know our deliveries have been terribly bad but we have made great headway with our production and it is now improving every day.

Our prices we have kept steady all the year and increases in certain raw materials we have been able to absorb ourselves, due to our increased production. Further, we anticipate being able to keep our prices steady during this coming year, and, in fact, even reducing them at the slightest sign of any lower costs in any direction.

I am glad to say we have again made a reasonable profit this last year and the production bonus paid out to our employees reached just over £60,000, which was a considerable increase on last year.

I am naturally particularly pleased this has happened this year, just in time for my 70th birthday, and it is, of course, the very best birthday present I could ever have wished for. (I happen to know that everyone worked flat out to get this grand result.)

Now for a few comments on other matters.

Our extensions have gone ahead very well and our new Foundry Building is finished and at work. Our new double-storey Front Building was delayed a little, but it is now rapidly taking shape; the steelwork beginning to look imposing and the completion of the building expected in another three months. This will give us quite a bit more room, in fact, about 12,000 sq. ft.

Then we have another double-storey building going up at the back of our Works; licence granted, site levelled, bricks in and work started. This particular building will give us yet another 25,000 sq. ft.

Now with regard to plant.

Our new Degreasing and Rust-proofing Plant is now working quite smoothly and is a big asset. Our new Continuous Vitreous Enamelling Furnace will be working in about another month. This will make a huge difference to our production.

Our whole Works is now mobile with Electric, Petrol and Diesel Fork Lift Trucks and all our Storage Racks are also portable. Most materials are carried to our Assemblers by overhead conveyors.

There are lots more things I could tell you, but why not come down and see them for yourself.

All this very modern equipment, of course, costs a lot of money, which reminds me about "financial structure", which matter I generally touch on in this annual report. Many friends say I keep talking about it but never do anything and I am afraid I have to admit that so far this is perfectly true. Up to the present, after endless discussions, I seem always to come back to the same conclusion, which is that I can see no better scheme than just carrying on as I am, namely—as a Private Limited Company. To turn the concern into a Public Limited Company, I feel I should just lose my present freedom of action. As things stand now, I often take risks which I should not take if I had a lot of shareholders to consider, also, of course, I should not be able to plough back the bulk of the profits as I do now, and always have done.

It rather seems, therefore, that this matter of forming a Public Limited Company will be delayed for the moment at any rate, irrespective of death duties, capital appreciation and all the other stories I get told about.

Now just a word about the future.

Our No. 47A Cooker which is proving so popular and gives so little trouble, we propose keeping just as it is, except for the continual small detailed improvements we are always introducing as a result of experience. None of these will affect the frontal appearance in any way, so no queries will arise as far as hire purchase of this particular model is concerned.

The Nos. 45, 51 and 53 Baby Cookers also remain as they are.

With regard to fires. Our present catalogue which has just been issued, will, as a matter of fact, be about right for next season.

The target I have set for this coming year is 50% above what we have just done. This is quite a big target but everyone down here in the Works seems to have already made up their minds to achieve it.

I nearly forgot to say, the little all-electric house at Bournemouth, which I mentioned last year, got held up for a building licence, but there are now some hopes of getting along with it.

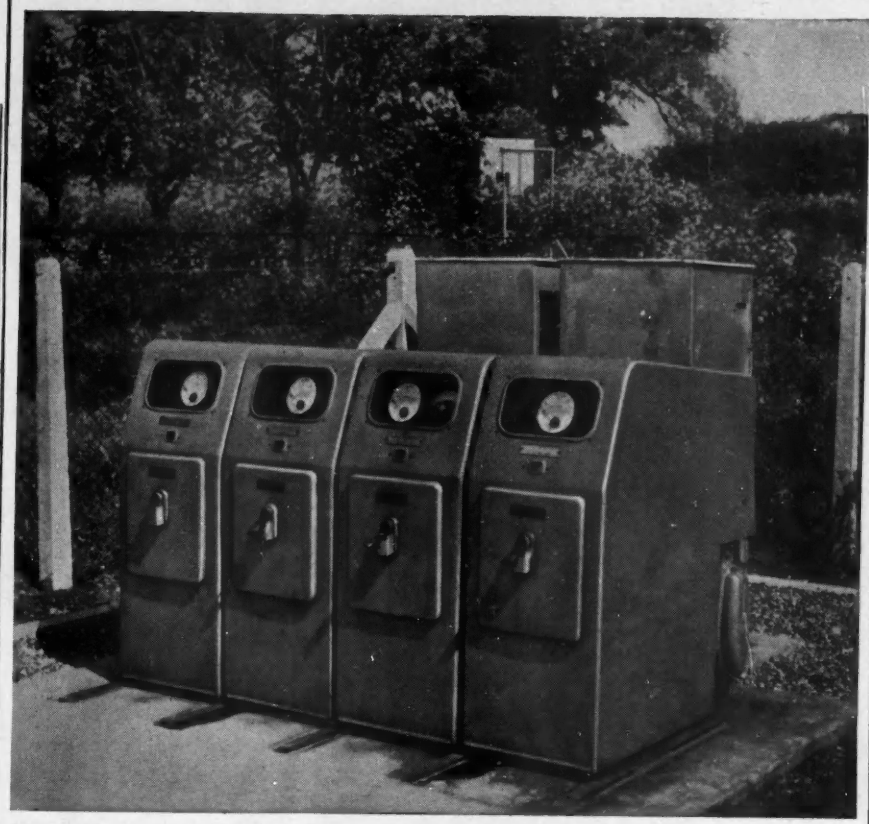
Finally, we are all jolly happy just at the present, we all keep very well, we are all het-up and excited about the coming year, which, of course, depends very largely on the support we get from you.

With best wishes and many thanks to all those I know personally and, in fact, to all those who do business with us now—not forgetting those we hope to do business with in the future.

H. Belling

Belling & Co. Ltd., Bridge Works, Enfield, Middlesex. Howard 1212

Preserve RURAL Amenities



IVIO Switchgear, 11kV Outdoor Substation

Photographed after 3 years' service in the Home Counties

Transformer and Feeder Units with relay, telephone and battery cabinets at rear

"Plug-in" Load M/B or Fault Make oil switches, or automatic Fuse units can be supplied interchangeable with o.c.b. units

(Available for indoor use)

YORKSHIRE SWITCHGEAR & ENG. CO. LTD.

LEEDS —— LONDON

Associated with Electro Mechanical Mfg. Co. Ltd., Scarborough

B.I.F., BIRMINGHAM
Visit our
STAND No. C419

Burco

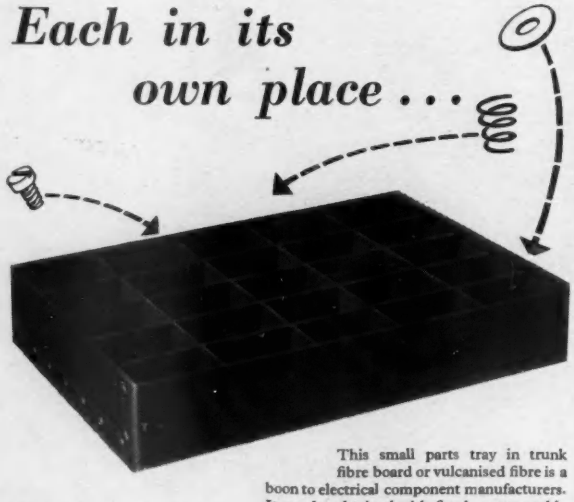
MODEL E650 ELECTRIC WASH BOILER

The practical answer to modern washday needs, combining efficiency with attractive design.
Your customer will have trouble-free washing for years with the Burco E650.
Supported by bigger advertising than ever.

The Aristocrats of Electric Washday Appliances

BURCO LTD.
ROSE GROVE, BURNLEY, LANCASHIRE
Also Manufacturers of the famous Burco all-Electric Washing Machine.

Each in its own place . . .



This small parts tray in trunk fibre board or vulcanised fibre is a boon to electrical component manufacturers. It can be obtained with fixed or removable partitions to hold variable amounts of small parts. Moreover, where female labour is used the lightness of fibre board for lifting and carrying will be appreciated by its users. The Enfield small parts tray is guaranteed to cut fatigue and muddle—this must result in a definite upward trend in production.

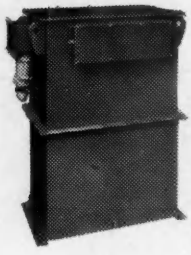
Fibre Board is STRONGER and LIGHTER

ENFIELD BOX COMPANY LIMITED

Queensway Enfield Middlesex Phone: Howard 1888 (2 lines)

STURDY TRANSFORMERS

live up to their name

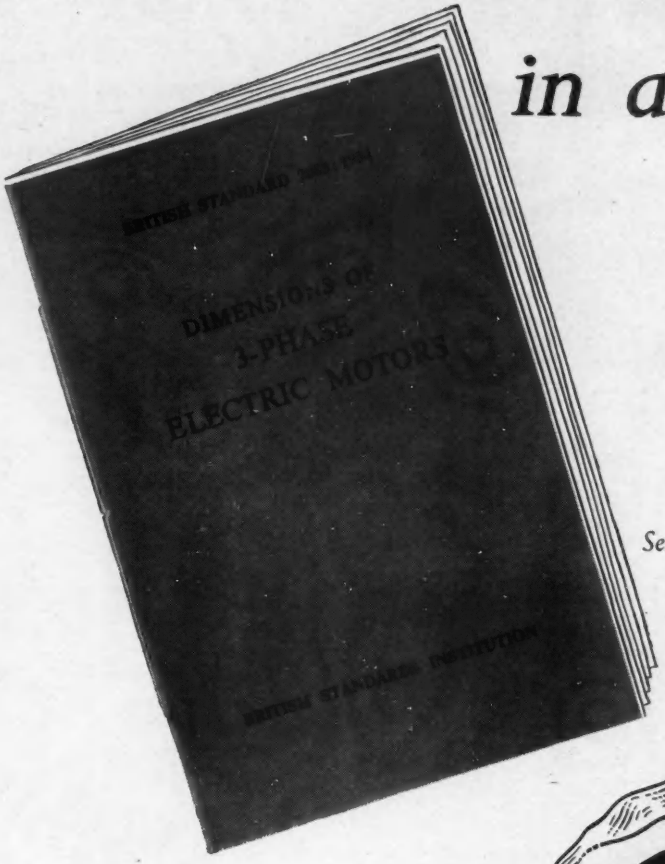


Sturdy Transformers are manufactured from 1 kVA to 100 kVA for all industrial applications and our technical service is always at your disposal.

Sturdy
ELECTRIC CO. LTD.

BURNOPFIELD (Telephone 237)
NEWCASTLE UPON TYNE

Standardised dimensions *in a nutshell!*



Send for leaflet No 7020/2-2

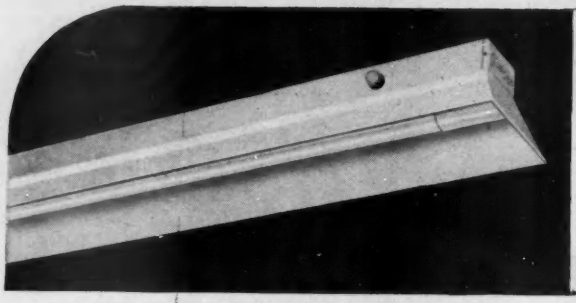
METROVICK Type KN-B

Squirrel - cage Motors

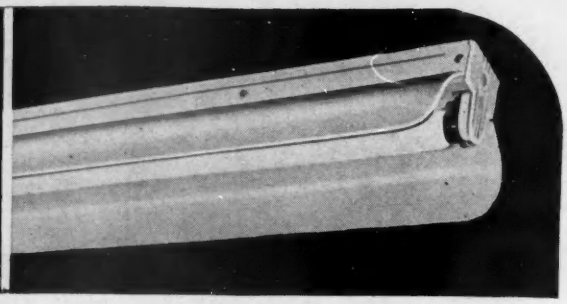
METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the A.E.I. group of companies

Matched to the job for lower lighting costs

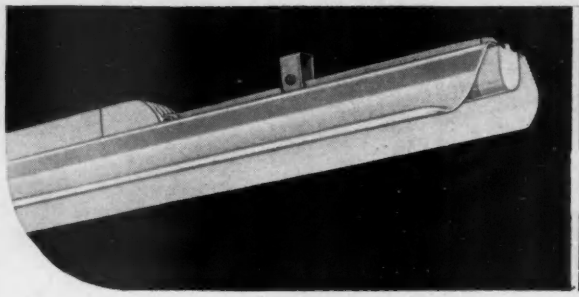


Closed End Metal Dispersive Reflector (BC 1111) with all-over ' Permawhite ' finish. Closed top or slotted. Ideal for end-to-end mounting. One or two 40w., 4ft. or 80w., 5ft. lamps. Prices from **£7.15.0,** complete with switch start Control Gear.

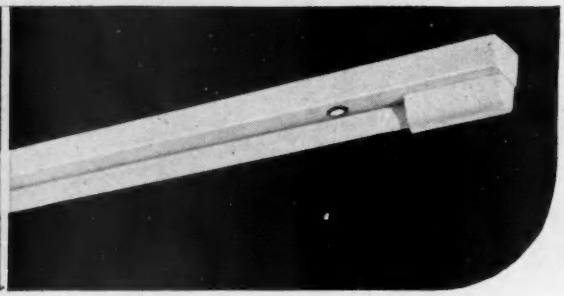


Open End Fitting with ' Perspex ' Side Screens (BT 1413) gives all-round diffused light. Metal parts ' Permawhite ' finish. For one 40w., 4 ft. lamp. **£10.10.0,** complete with switch start Control Gear.

Open End Metal Dispersive Reflector (AK 1111) for one 80w., 5 ft. lamp. Fully adjustable suspension centres. ' Permawhite ' stove-enamel finished, closed or slotted top. **£8.10.0,** complete with switch start Control Gear.



Batten Fitting (BB 1513). A simple inexpensive design for wide light distribution. ' Permawhite ' finish. For one 40w., 4 ft. lamp or 80w. 5ft. lamp. Prices from **£5.0.0,** complete with switch start Control Gear.



The Crompton fitting always offers a better solution to your lighting problem, easier installation and maintenance, and longer life. For instance, Crompton industrial fittings have the new ' Permawhite ' finish. It maintains high lighting efficiency, is easy to clean and corrosion-proof. The Crompton Rawl Cuff Clip brings ease and speed to fixing. Yet you pay no more for Crompton quality fittings than for most other makes.

BY APPOINTMENT MANUFACTURERS OF ELECTRIC LAMPS TO THE LATE KING GEORGE VI

Switch to

Crompton

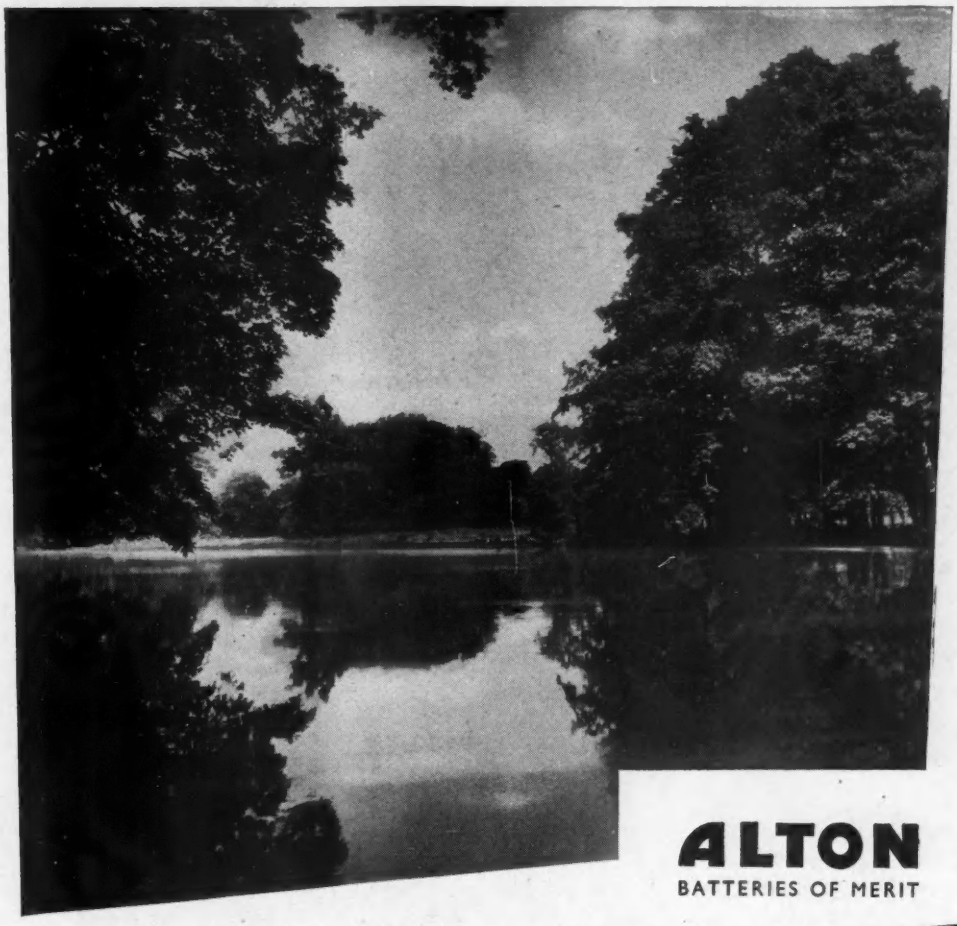
LIGHTING FITTINGS

ELECTRICAL EQUIPMENT

CROMPTON PARKINSON LTD. · CROMPTON HOUSE · ALDWYCH · LONDON, W.C.2

Telephone : CHAncery 3333 *Telegrams : Crompark, Estrand, London*

Right round the world, men know what Alton means. A storage battery—with a distinctive merit entirely its own. Where can distinction lie, in an era of rigid battery standardisation? One answer is that, in Hampshire, Alton means something else—a little country town. A town with a busy, neighbourly life within its boundaries, and the peace of lovely and unspoilt countryside beyond. A place where the sky is clean and growing things do well: flowers and fruit and children; a woman's pride in the home she makes—a man's in the skills of his trade. Making something better than 'well enough' is a habit that grows strongly in Alton soil. And Alton batteries are made by Alton men.



ALTON
BATTERIES OF MERIT

Alton stationary batteries: 10 to 15,000 Ah. Also in regular production, renewal plates for all makes of battery, British and Continental

A25A

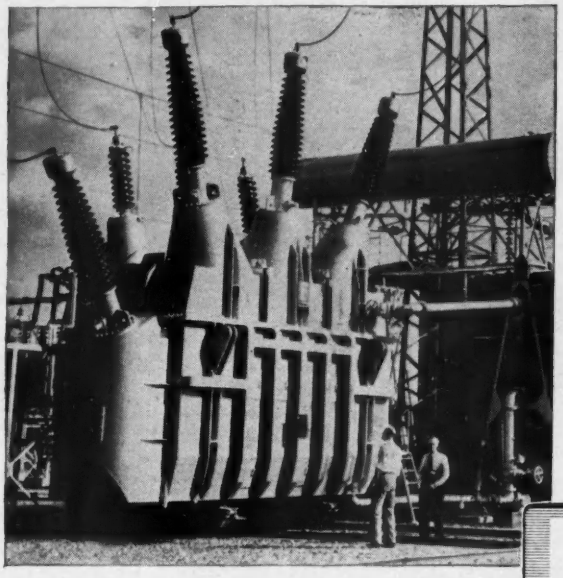
The Alton Battery Company Limited · Alton · Hampshire · *Telephone:* Alton 2267 and 2268 *Telegrams:* Battery, Alton

TRADE
HIGGS MOTORS LTD
CHAIRMAN WALTER F. HIGGS M.I.E.E.
MARK
BIRMINGHAM 6 ENGLAND

GEARED MOTOR UNITS
From One Revolution Per Minute
Up to 30 Horse-power
GUARANTEED FOR EVER

Belfast, Bristol, Cardiff, Dundee, Glasgow, Hull, Leeds, Liverpool, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

FERRANTI *in the east and in the west*



FINLAND

PYHÄKOSKI GENERATING STATION

Six Ferranti 230,000 volt three-phase transformers for the Imatra Power Company, Finland, were the first 230,000 volt three-phase transformers to be ordered in Great Britain. Each transformer is rated at 64/64/32 MVA, 231/115.5/10.5 kV and has a total weight, with cooling gear, of 220 tons.

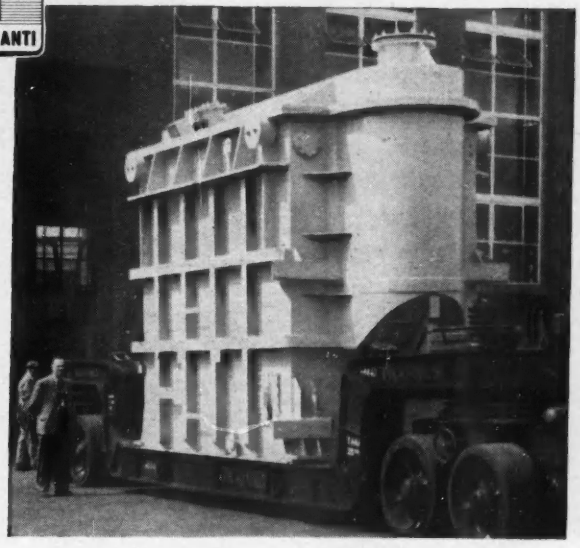
One of the completed transformers in commission at the Pyhäkoski Generating Station.

CANADA

ALCAN PROJECT BRITISH COLUMBIA

Ferranti have received the contract to supply four 71,000 kVA, 301,400 volt - THE HIGHEST EVER MADE IN BRITAIN - single-phase generator transformers and three 37,000 kVA, 275,000 volt step-down transformers, for the Aluminium Company of Canada project at Kemano and Kitimat, British Columbia.

One of the 71,000 kVA generator transformers leaving the Ferranti Transformer Factory at Hollinwood, for Canada.



GARRISON DAM PROJECT. N. DAKOTA, U.S.A.

Nine 33,333 kVA, 230,000 volt single-phase transformers have been ordered by the U.S. Army Corps of Engineers.

McNARY DAM PROJECT, OREGON, U.S.A.

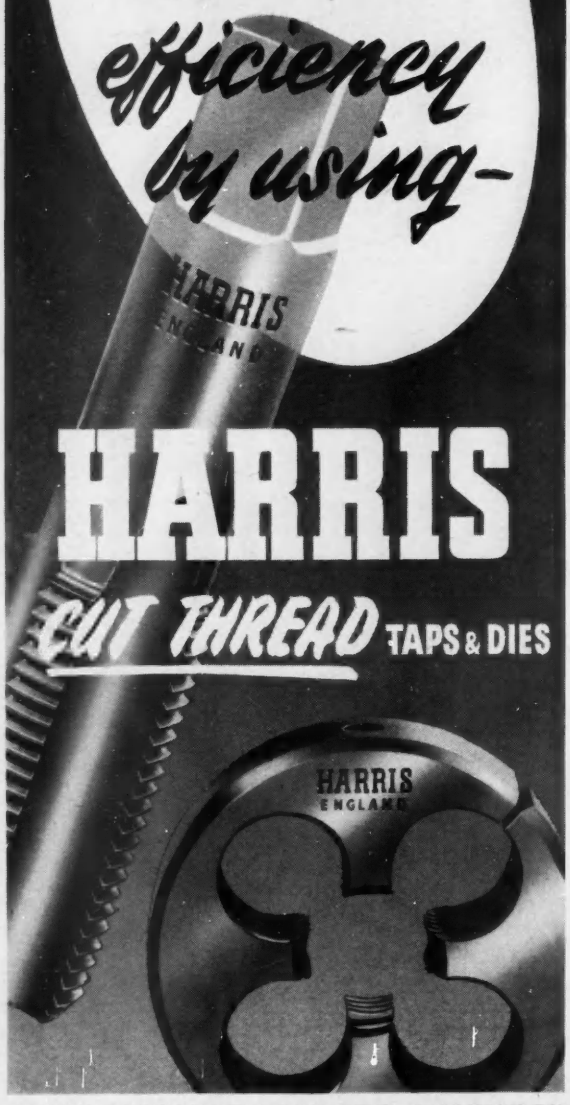
A contract from the U.S. Army Corps of Engineers, covers six 56,500 kVA, 230,000 volt single-phase transformers.

FERRANTI LTD · HOLLINWOOD · LANCS

London Office: KERN HOUSE, 36 KINGSWAY W.C.2

FT138

Cut your costs & increase efficiency by using-



HARRIS

CUT THREAD TAPS & DIES

JOHN HARRIS TOOLS LTD. WARWICK

Phone : 1041 (4 lines)

TESTED SUPER STEEL CONDUIT

Unvarying High Quality and Finish. Fully Annealed for Bending and Screwing. No Hard Weld or Internal Seams. Every tube passed and branded to B.S.S.31.Obtainable from stock from all leading Wholesalers.

GEORGE BURN LIMITED

CITY TUBE & CONDUIT MILLS
SMETHWICK BIRMINGHAM

Telephone: Smethwick 1511 (5 lines)

London: 2 Deansway, N.2
Liverpool: Caledonian Buildings, 14 Tithebarn St., 2
Edinburgh: 22 Shandon Place, 11

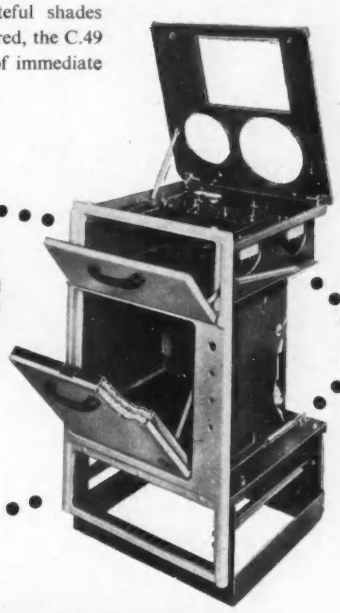
dm GB 22

the B·N·E C.49 Cooker

Chosen for

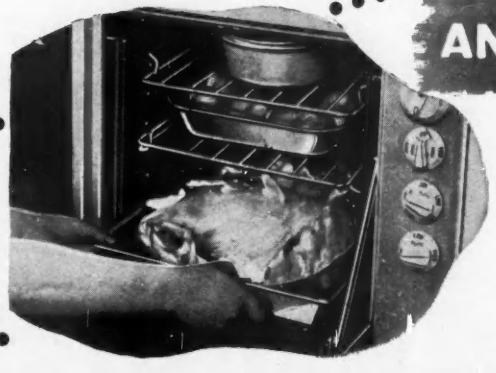
GOOD LOOKS

With its neat but robust, flush-to-floor design, its acid-resisting vitreous enamel finish in two tasteful shades of ivory, and a black hob for contrast if desired, the C.49 has a singularly pleasing appearance that is of immediate appeal to the eye.



STRONG CONSTRUCTION

Best quality materials and first-class workmanship go into the C.49's construction—two factors which ensure long life and trouble-free service. Solid though the C.49's construction is, moreover, the design is such that all parts are readily removed or accessible for cleaning and servicing.



AND FINE PERFORMANCE

The C.49 not only provides ample cooking capacity, but a performance that is a constant source of pleasure to the most discriminating of users. The thermostatically controlled oven, for example, is particularly commendable for its even spread of heat, while the B.N.E. grill-boiler is outstandingly efficient when used for either grilling or boiling.

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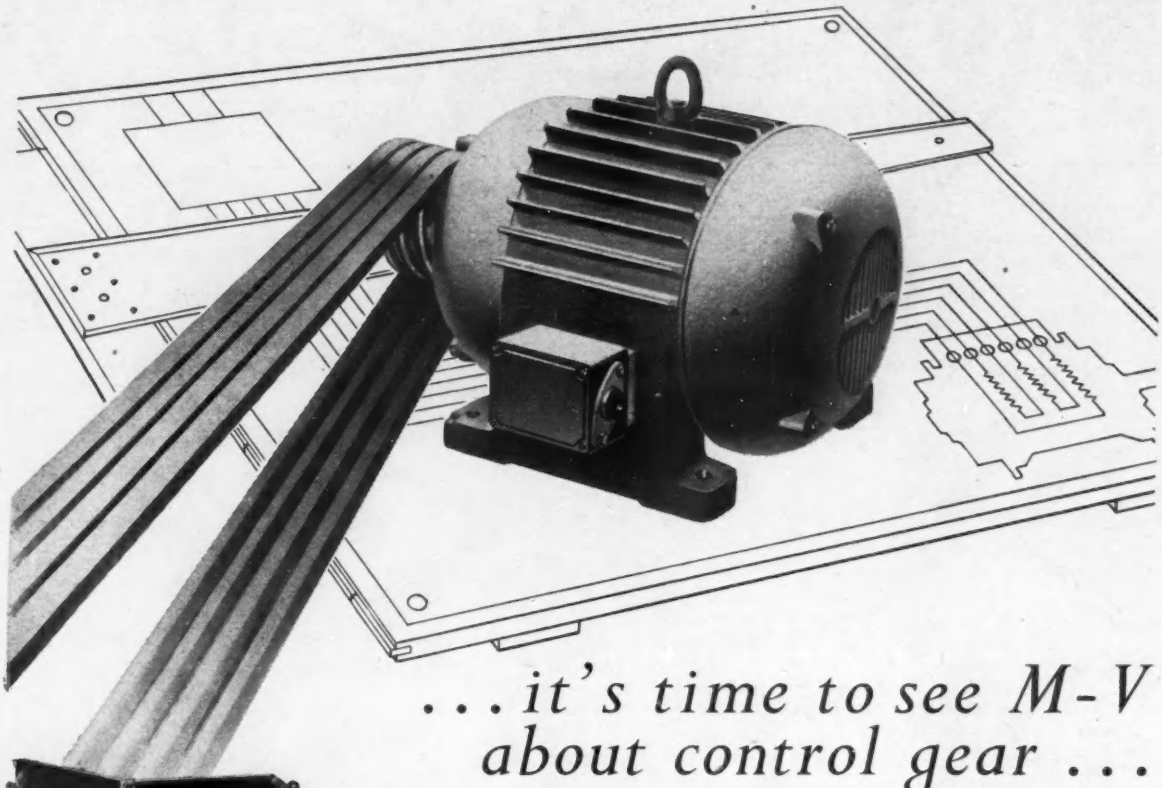
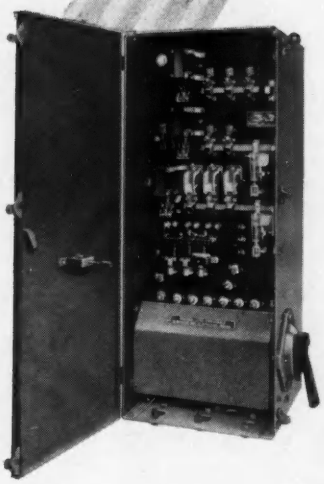
THE CRESSALL MANUFACTURING CO. LTD.
TOWER STREET · BIRMINGHAM 19

When a Motor Drive is on the drawing board ...

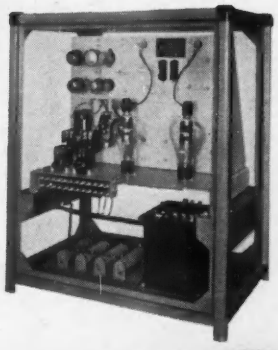


... it's time to see M-V about control gear ...

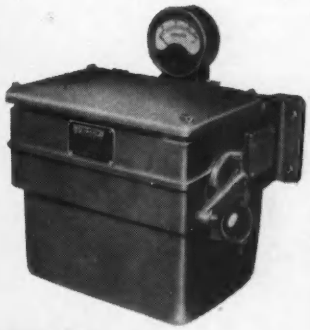
When you are thinking of installing a motor, think also of Metrovick control gear. Trouble, time and cost are saved by consulting M-V when a motor drive is in the planning stage. M-V design and build all types of control gear from switch-starters for fractional hp motors to elaborate electronic controls for complex industrial processes. The experience of M-V engineers therefore covers the complete range of control gear and their practical advice is at your service.



M-V Stator-rotor Contactor Starter



M-V Electronic Speed-control Equipment



M-V Hand-operated Oil-break Starter

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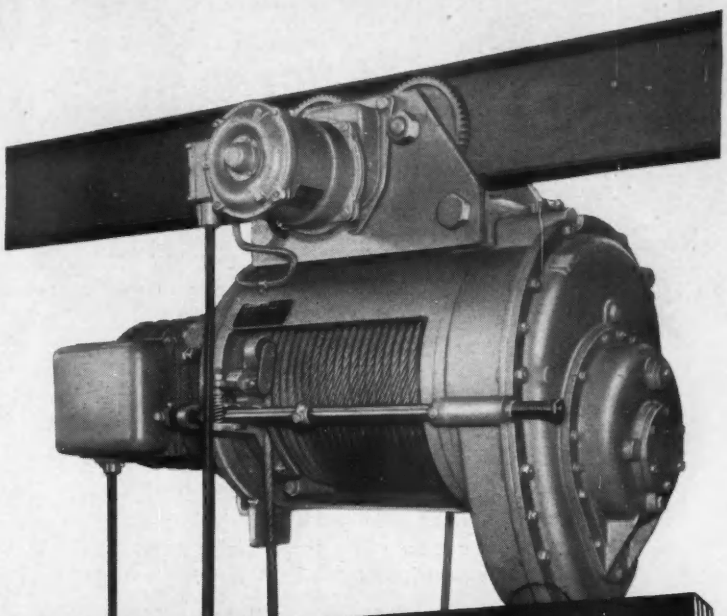

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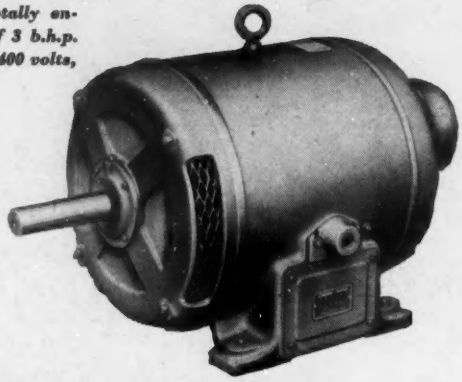

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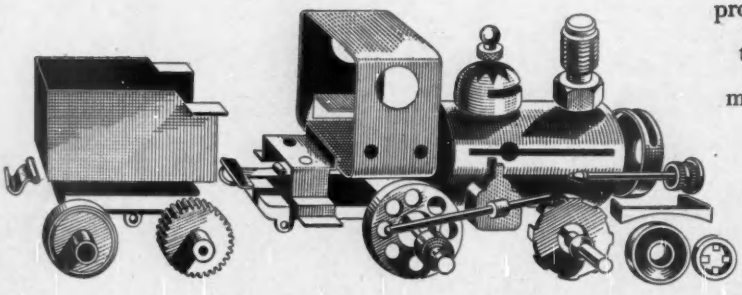

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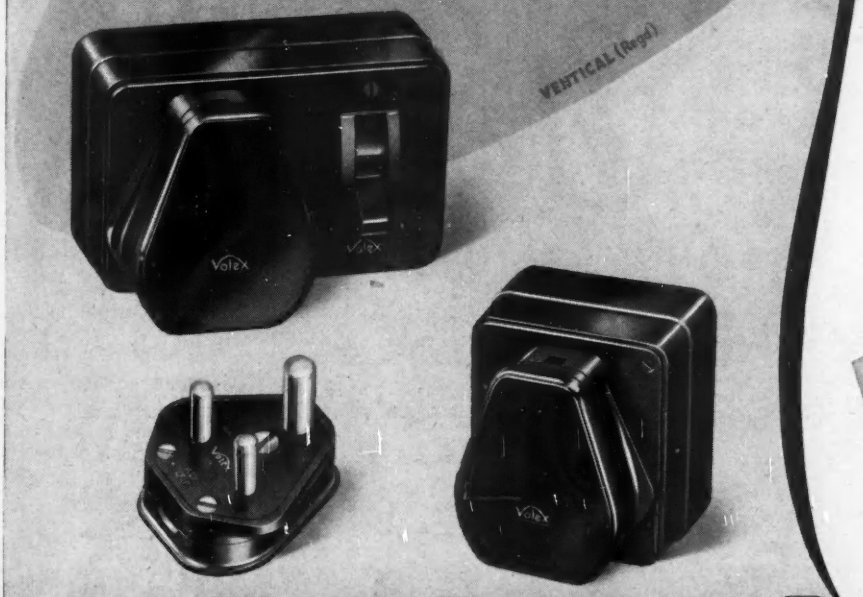

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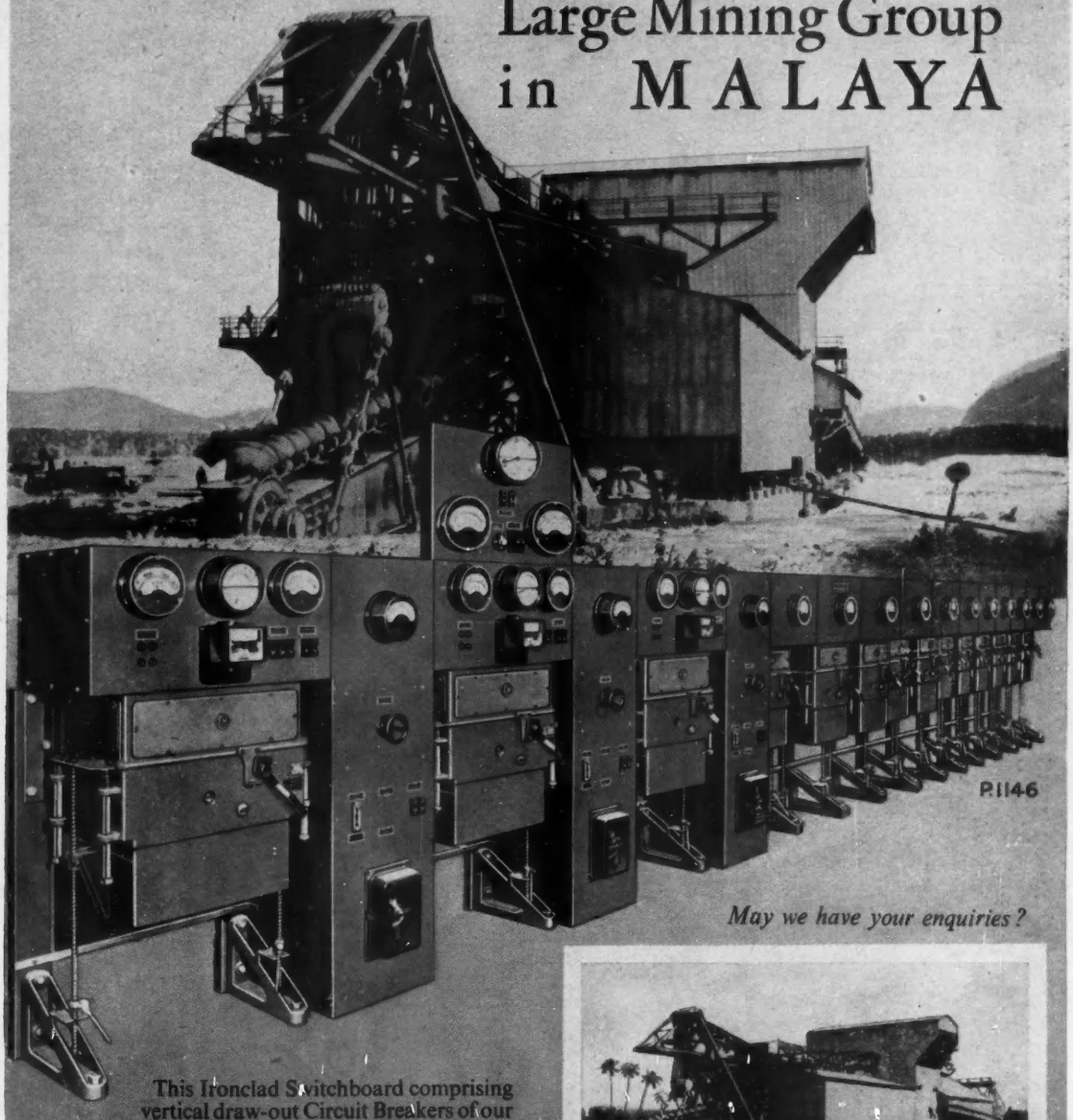
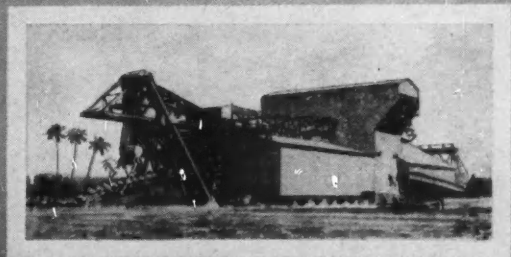


May we have your enquiries?



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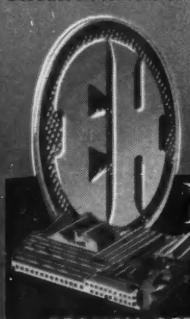

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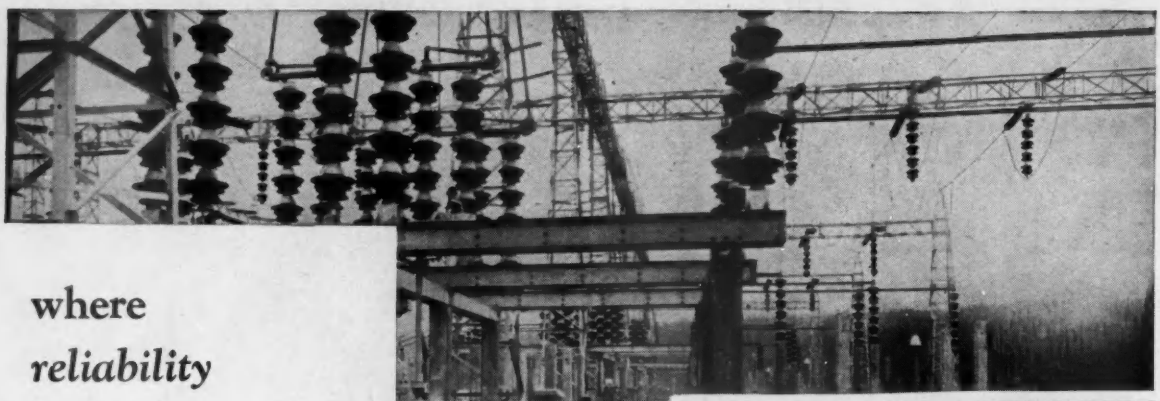

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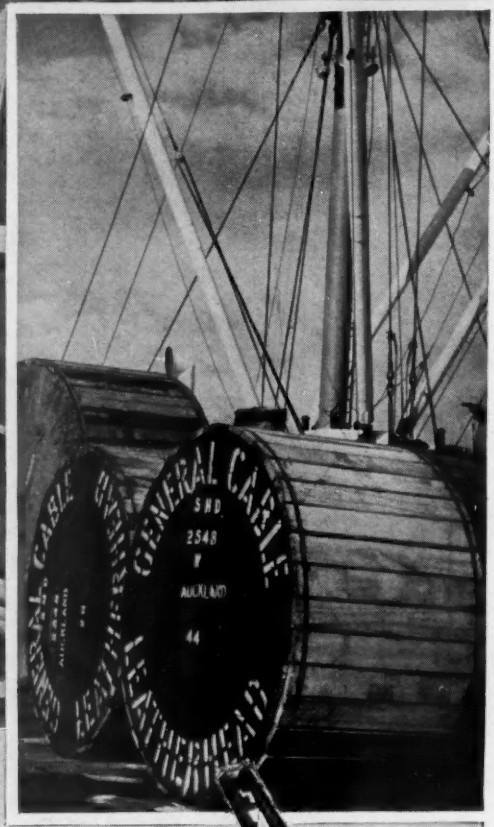

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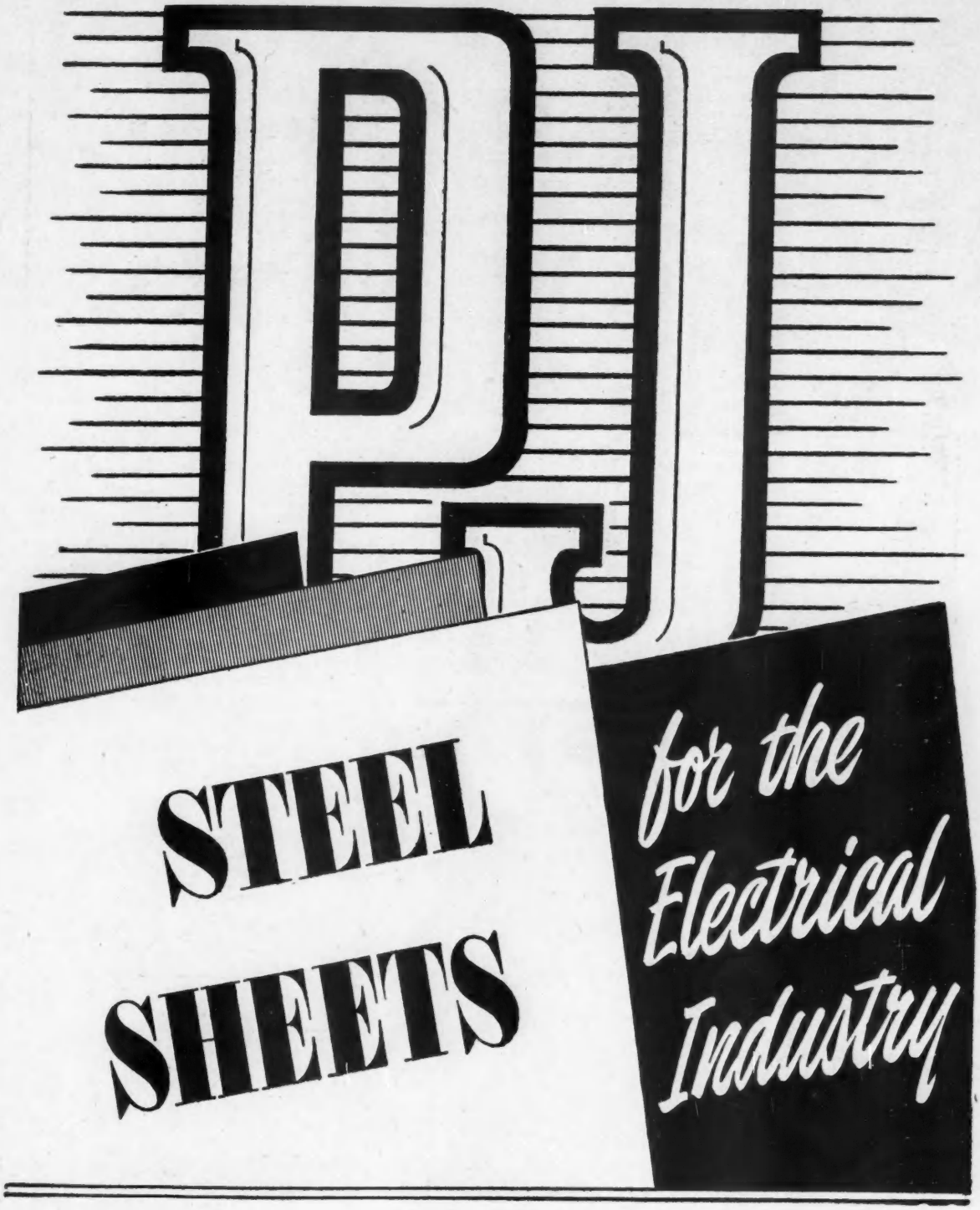

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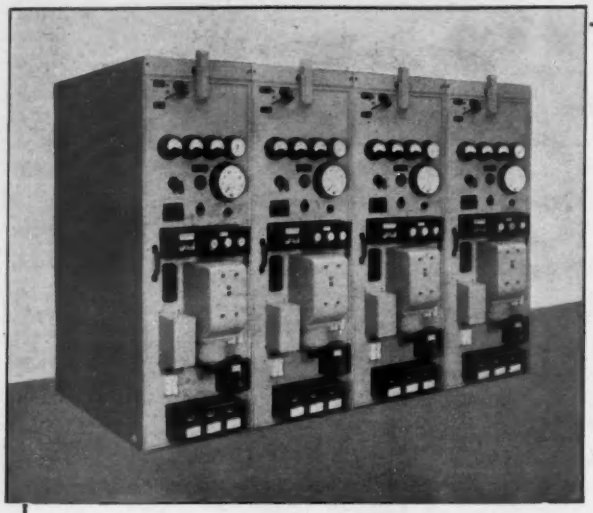

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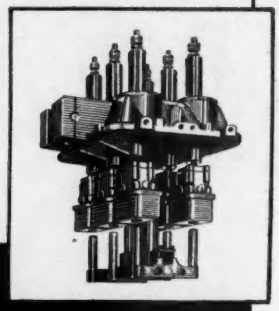

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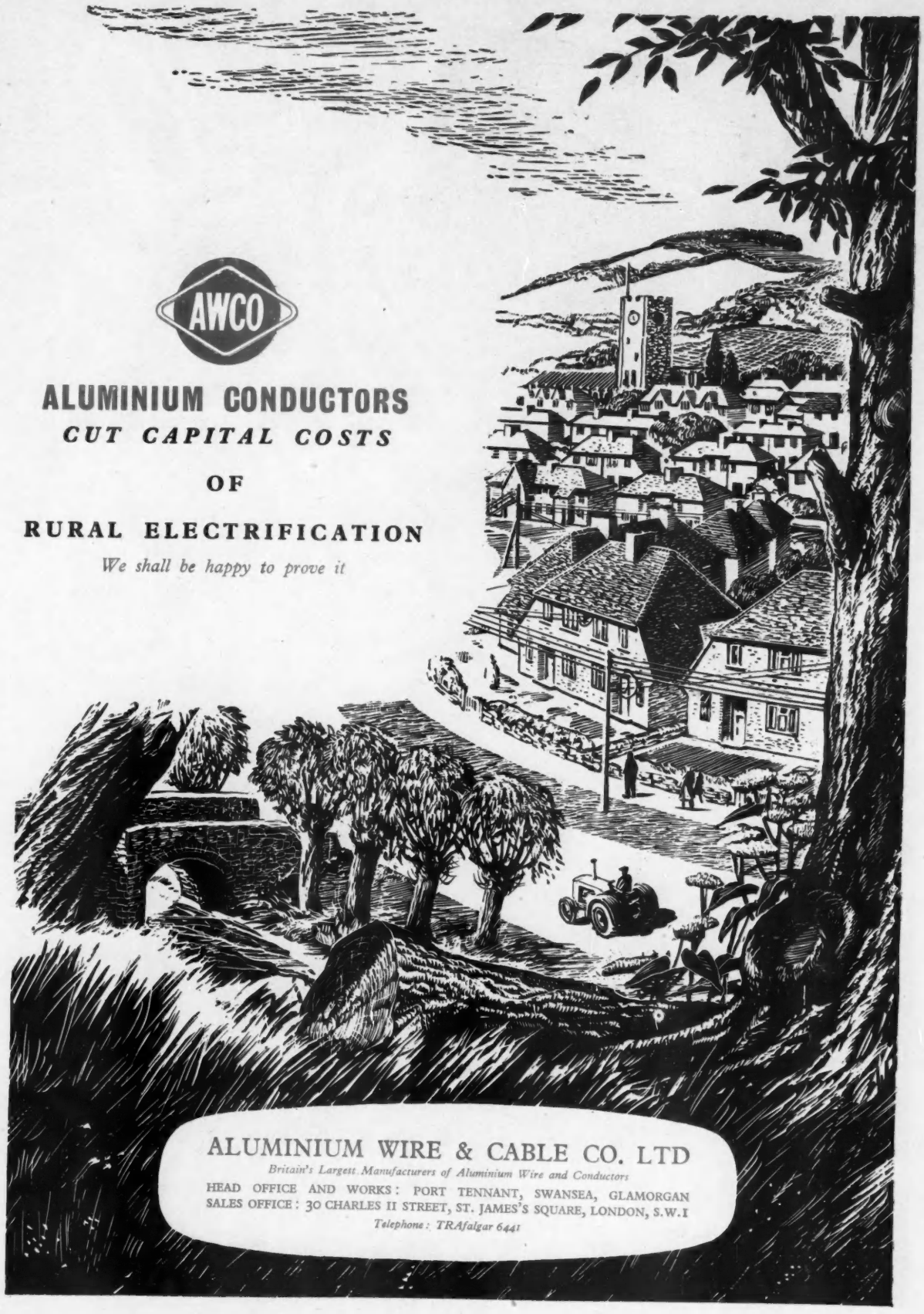

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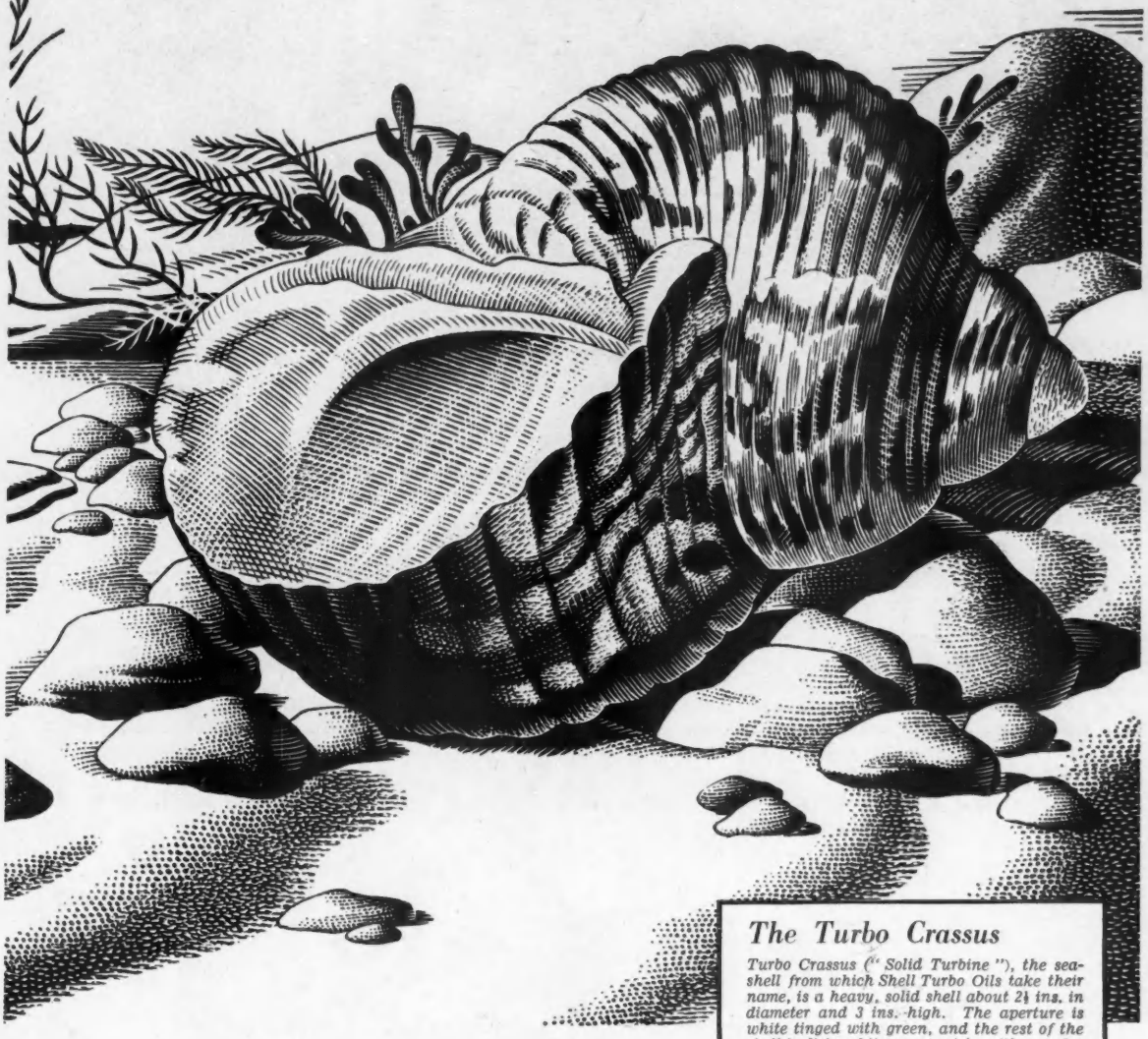

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Turbo Crassus ("Solid Turbine"), the seashell from which Shell Turbo Oils take their name, is a heavy, solid shell about 2¼ ins. in diameter and 3 ins. high. The aperture is white tinged with green, and the rest of the shell is dirty white or greenish, with angular black or brown patches on the ribs. Turbo Crassus is found off the coast of North Australia and New Caledonia. Shell Turbo Oils are part of the wide range of Seashell Oils, all of which are named after seashells.

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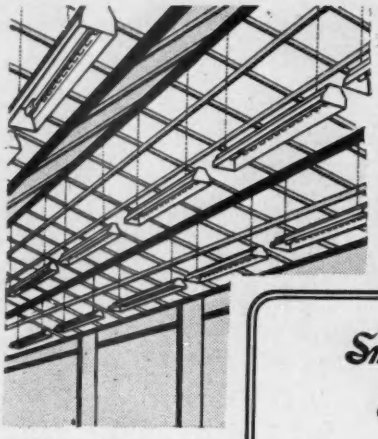

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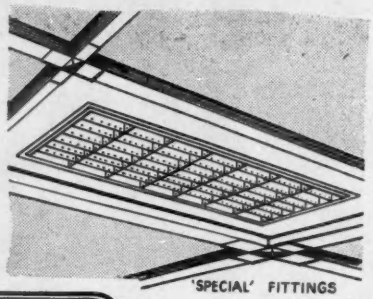

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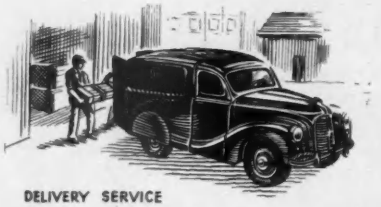

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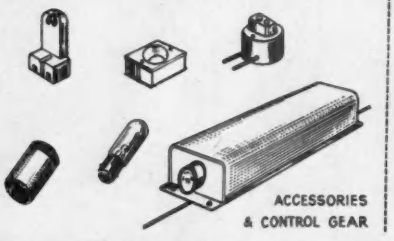

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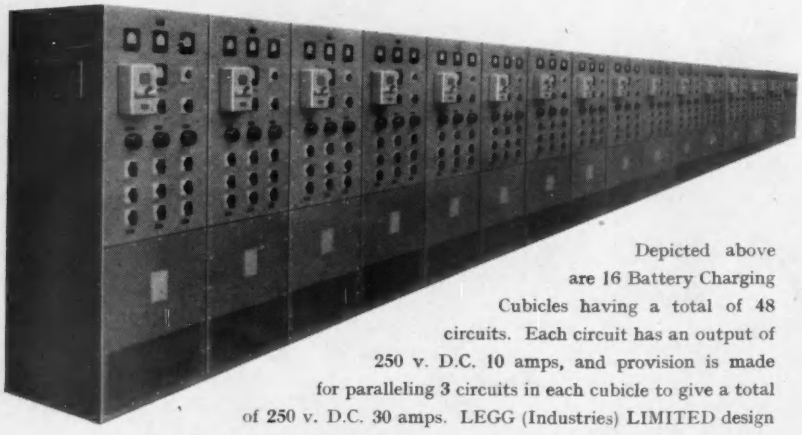
16 BATTERY CHARGING CUBICLES



This panel has been specially designed and manufactured for an overseas customer.

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A section of the rear view of 3 typical cubicles.

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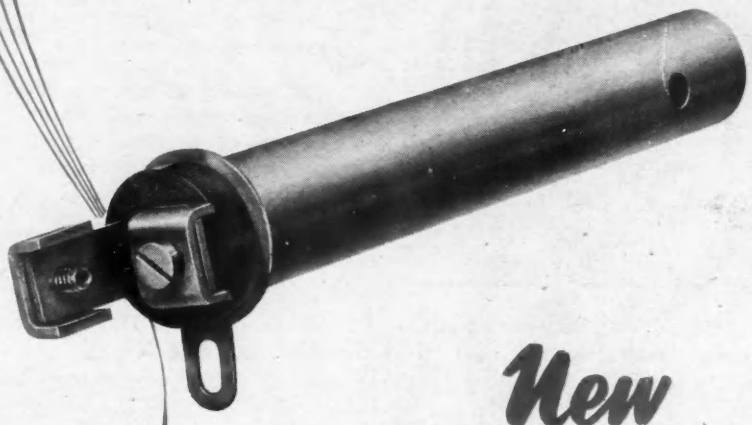

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Oswin Mills, Frizinghall, Bradford. Photo, by courtesy of Samuel Rushworth Ltd.

Electrical Contractors for this important installation: A. R. Farrar & Co. Ltd.

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Illustration shows a consignment of signalling cables for British Railways.

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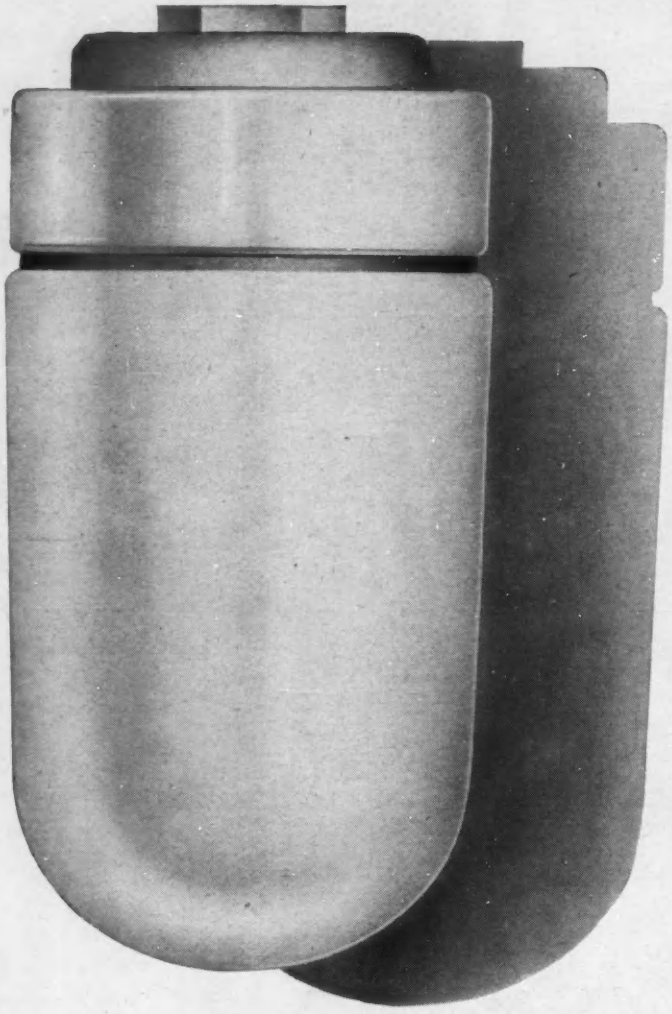

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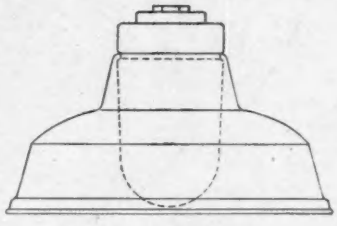
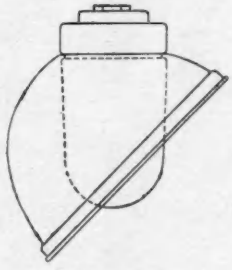


List Nos. 1002A-1012A Standard Dispersive Model



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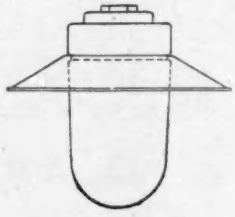

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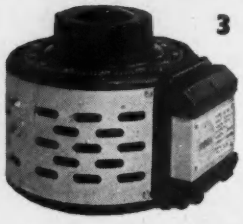

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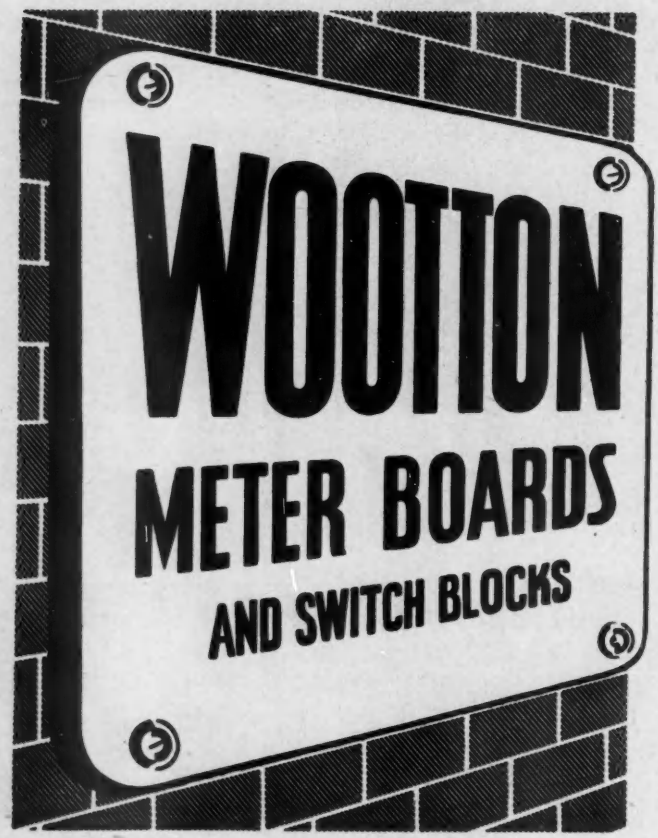

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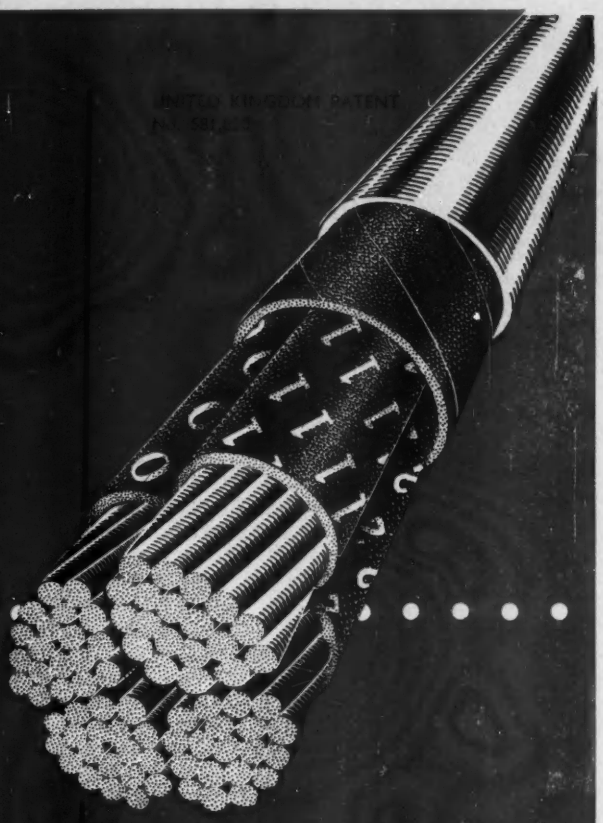

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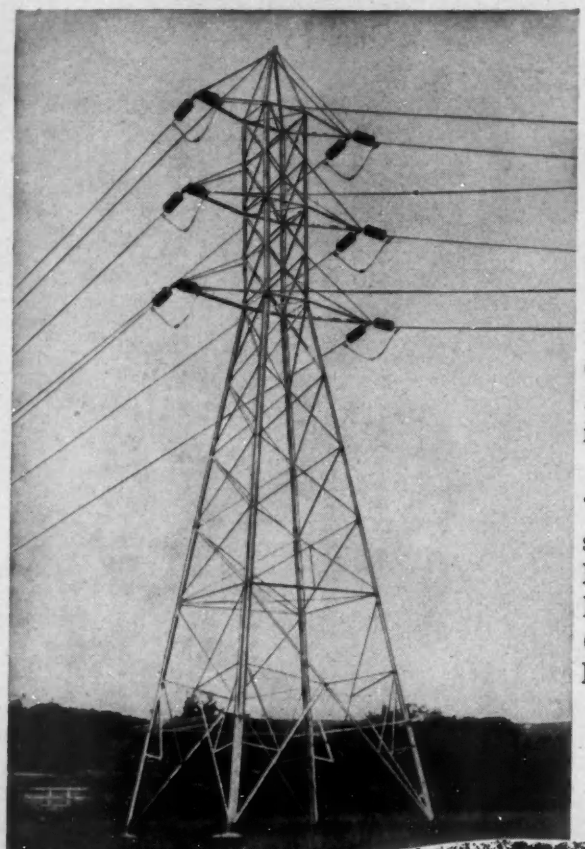

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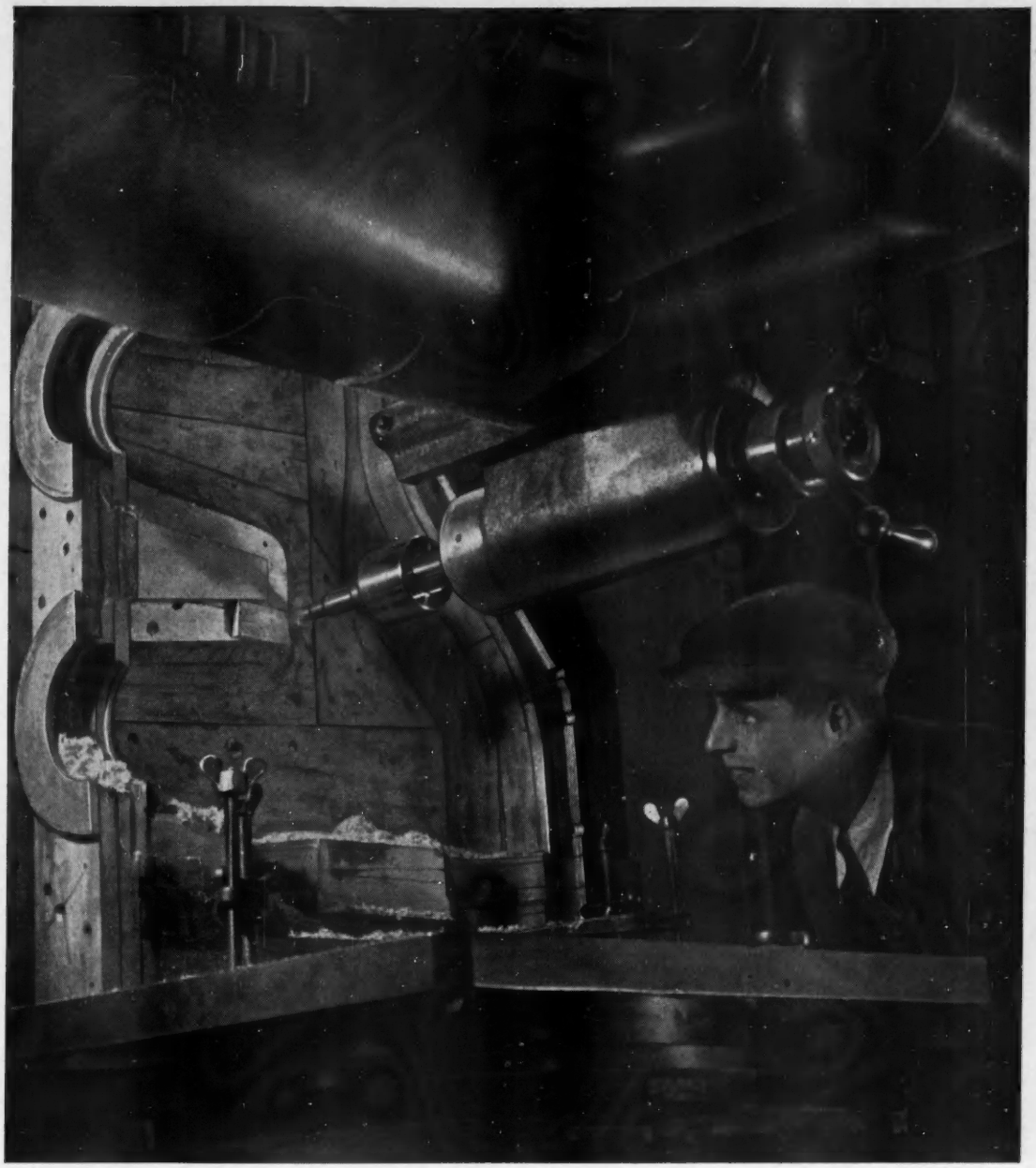

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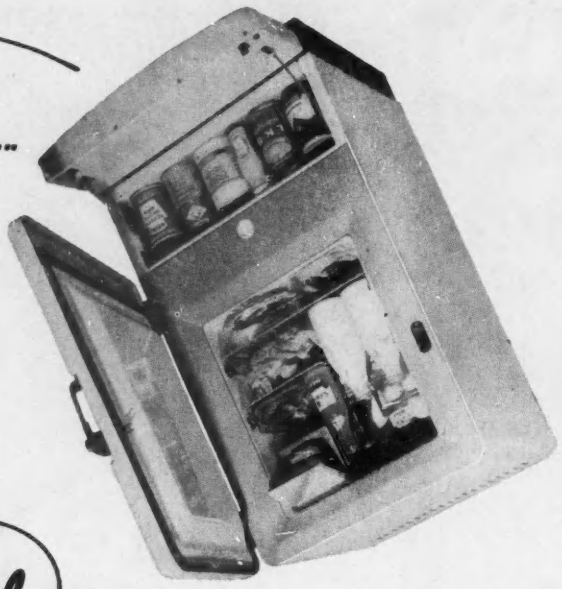

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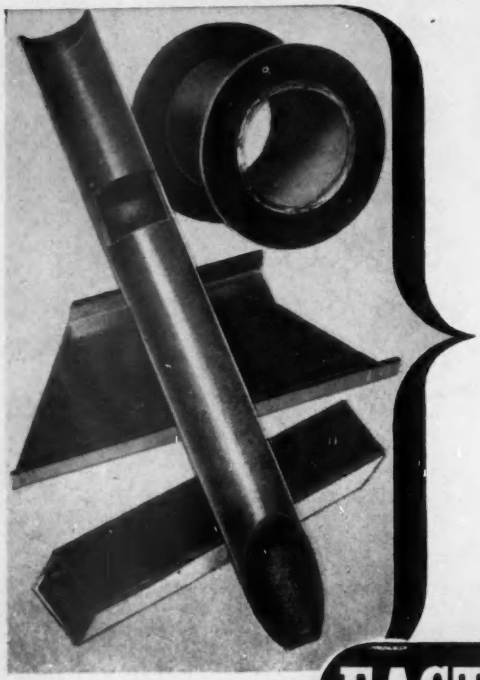

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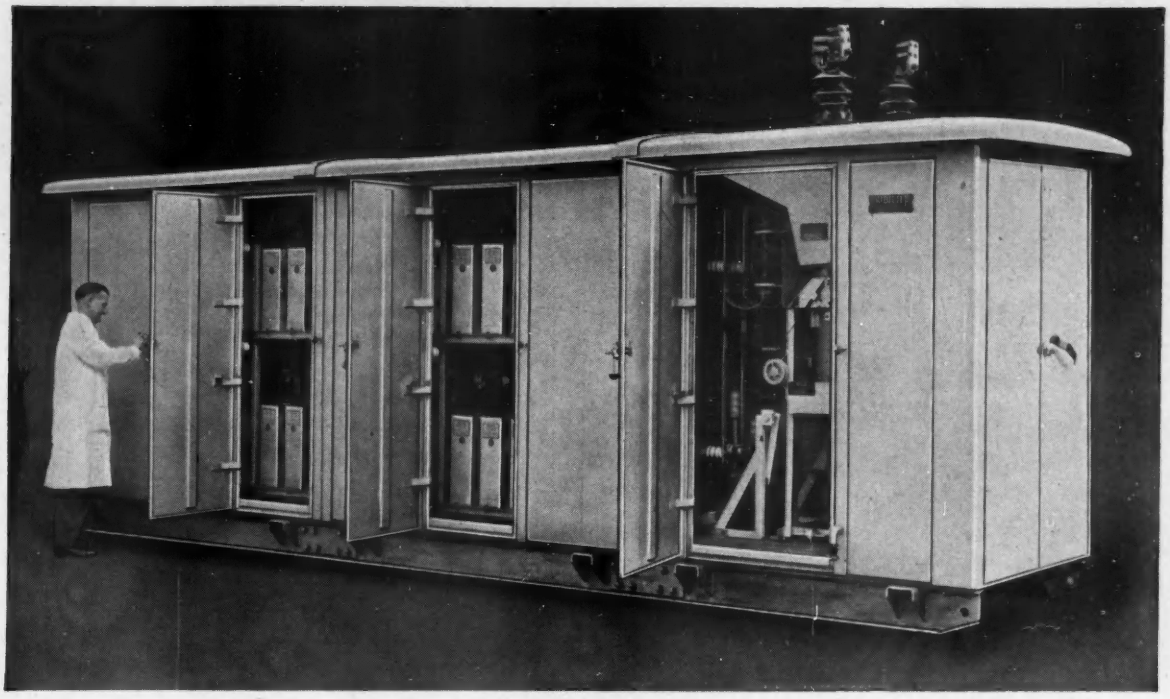

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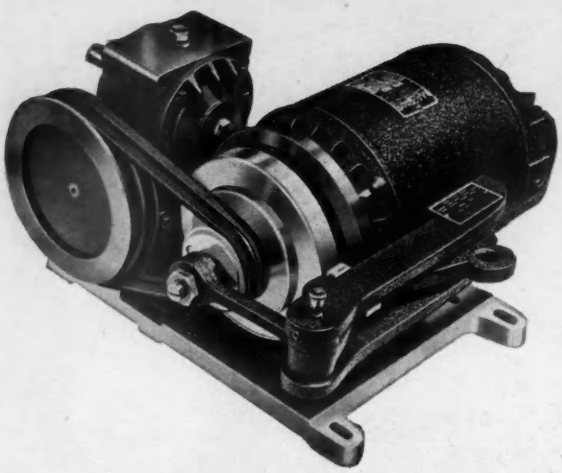

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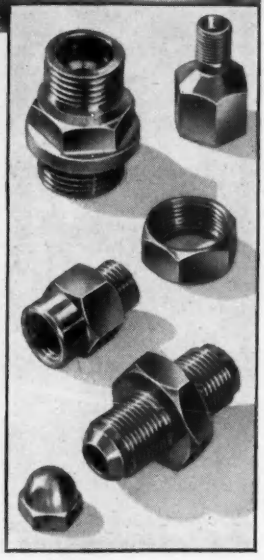

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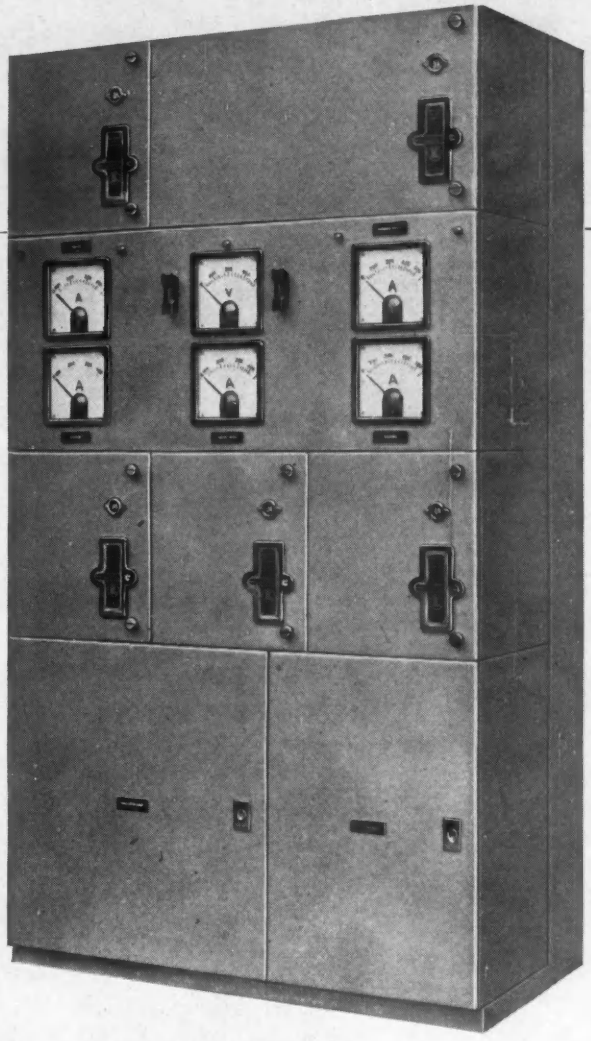

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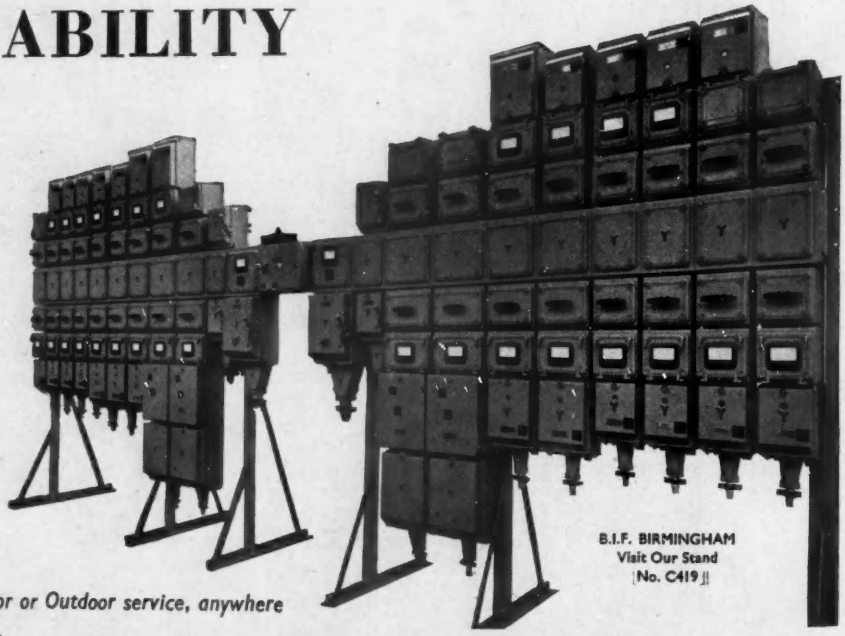

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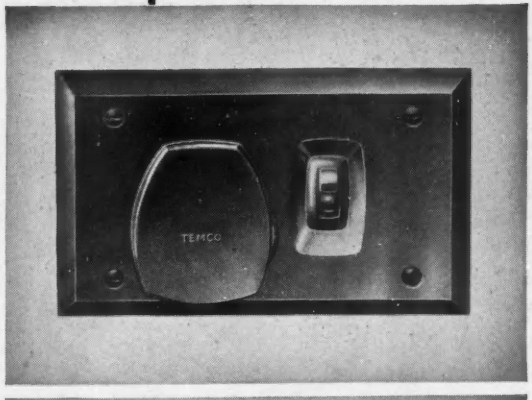

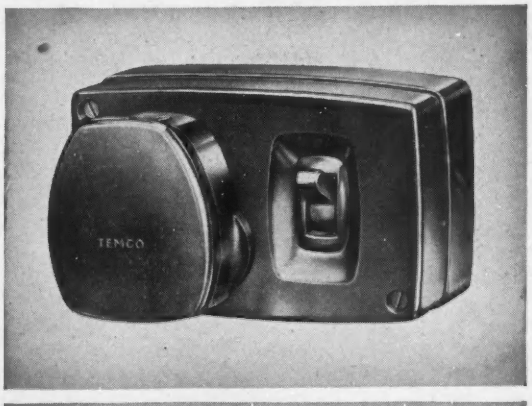

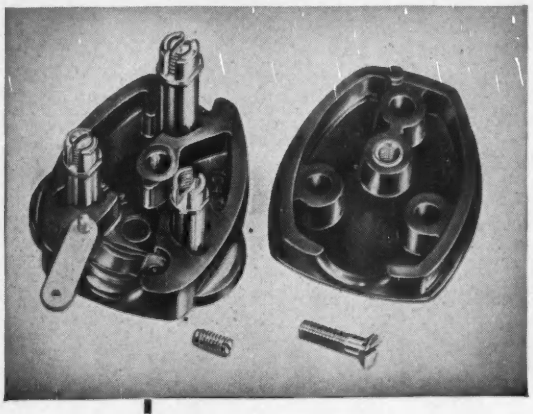

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 8 APRIL, 1954
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THE CROSS CHANNEL LINK

The remarkable attendance at the I.E.E. last week, on the occasion of the presentation of the paper on the cross channel link, served to emphasise the widespread interest this subject has aroused, not only in this country but all over the world. A notable feature of the meeting was the enthusiasm displayed by all present, and it was obvious that the boldness of the concept had fired the imagination of many people in the industry. Even though many details remain to be finalised, the utmost confidence was expressed by representatives of the cable makers, both French and British, that technical difficulties can be solved. The only point on which some diffidence appeared, lay in the sphere of operation where the problems involved do not appear so readily amenable to solution. It is hoped however, that the series of experiments now being carried out on the networks of both countries will yield data on which a theoretical analysis can be based to derive the magnitude and probability of load swings between the two countries. The degree of control required, particularly of frequency, can be appreciated by the existing estimate that a change of frequency of 0·1 c/s in Great Britain is now equivalent to an over- or under-generation of some 300 MW, while in France the corresponding figure is 100 MW. As was pointed out by Monsieur P. Ailleret, however, the loss of the connection temporarily due to overload tripping would by no means be a major disaster; in fact its effect on either country would be less than that of the tripping of any major line feeding a comparatively small town, as the consequent frequency drop would scarcely be noticed.

FUTURE FOR D.C.

It was inevitable that the vexed question of high-voltage d.c. should have been raised, and protagonists of this system may well have taken new heart from the optimism of Mr Rusck of the Swedish State Power Board, when he referred to the 100 kV Sweden-Gotland submarine d.c. transmission system. Although the line has not yet been fully loaded—an unfortunate cable fault some 20 miles out to sea prevented its schedule operation on 20th March at 10 MW—it had nevertheless been operating for several days at a loading of 2 to 4 MW, and the mutators and rectifiers had behaved perfectly. The problem of corrosion, one of the major troubles with d.c. working, has been reduced by placing the return electrode system some six to eight miles south of the cable shore ends. But the efficacy of this and of the system in general will of course require considerable experience

before it can be accurately assessed. A point, however, not mentioned by Mr Rusck, which may have a most important bearing on the possibility of cross-channel d.c. operation, is the effect of the magnetic field on ships' compasses, which is a serious matter in such narrow waters as the Channel carrying a heavy marine traffic density.

TECHNICAL PUBLIC RELATIONS

Concern with the technician has been one of the outstanding features of electrical engineering organisational thought since the war. As we have had occasion to remark before, the "technician" is in some respect a post-war invention the term serving as a discreet equivalent for "non-professional" engineer, as well as the more technically advanced craftsman. But whatever the phrase used, it remains a fact that the well being of electrical engineering is largely dependent on such men, and it was entirely appropriate that the question of their training and their recruitment to the industry should have received close attention in two of the principal speeches at Friday's Annual Dinner of the Association of Supervising Electrical Engineers. It was the President of the I.E.E. who first dealt with the subject, and his approach was largely that of recruitment; more technicians would be available, and for that matter more professional electrical engineers, if those at present employed in the industry would make its attractions and opportunities better known to the general public. The National Chairman of the A.S.E.E., who took up the same subject, felt it necessary to bring a reminder that one of the characteristics which distinguish the supervisory technician from the craftsman is breadth of responsibility and that the latter brings cares which are being insufficiently compensated by the dwindling differentials between wages of foremen and operatives. Although the I.E.E. would doubtlessly hasten to dissociate itself from any consideration of pecuniary awards, it is apparent that these have a direct bearing on the question of good public relations for the industry which the Institution is so properly seeking. It is of little use exhorting engineers to praise the industry to outsiders if they do not believe that it is giving them a fair deal.

TRAINING FOR SELLING

Training for selling is in many ways as important to the continued health of the supply industry as training for purely engineering techniques. Yet while the latter is the subject of organised courses at all levels of skill, selling receives less systematic attention. So it is good to find marked attention given in this year's Electrical Development Association conference to the training of commercial engineers and other technically qualified members of the commercial departments of the area boards. Something more than enthusiasm for the potentialities of electricity and a smattering of electronology is needed today in the highly competitive business of selling power to industrialists; at a corresponding conference a year ago the gas boards were speaking in terms of a 19 weeks' residential course for certain salesmen, and that is a standard which electricity must be able to surpass. The most interesting suggestion in this respect from the various papers that give attention to the problem at this week's conference, is the Southern Electricity Board scheme for organising a joint commercial and engineering apprenticeship that will turn out young engineers having a firm grasp of the principles and practice of selling. So far this is only an experiment, and one whose results will not be known for some years. Nevertheless, it deserves encouragement, for although such schemes are unlikely to be able to supply the full requirements of the industry for commercial and specialist sales engineers, they should provide a well grounded cadre of men around which the recruits from other departments may be formed.

THIRTY PER CENT!

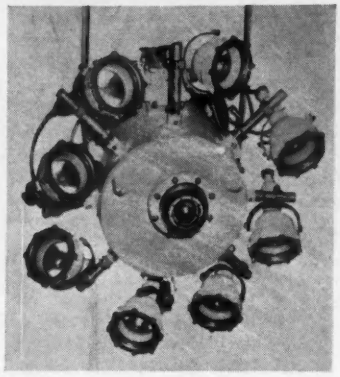
It is an appropriate chance of the electrical calendar that the yearly list of power station thermal efficiencies appears close to the time of the E.D.A. Sales Conference, for it regularly underlines the encouraging fact that electricity supply is an increasingly efficient business. This year there is really something to shout about, for no less than three stations have passed the 30% efficiency mark that has been the round-figure aim for some years now, while the 23·22% average efficiency of all steam stations shows a proportional improvement of 2·7% on the 1952 figures, which means an annual saving of more than £3m in current coal prices, as well as an economy in the use of this distressingly scarce mineral. For the engineer the efficiency figures give satisfaction for the successful advance in technique which they mirror, but their principal effect is in the wider field of the public view of electricity in home and industry. The point which politicians and solid fuel publicists must not be allowed to forget, is that coal efficiency of electricity generation is now nearly 8% higher than it was when the Ridley Committee deliberated, and so the conclusions of their report must be adjusted in electricity's favour.

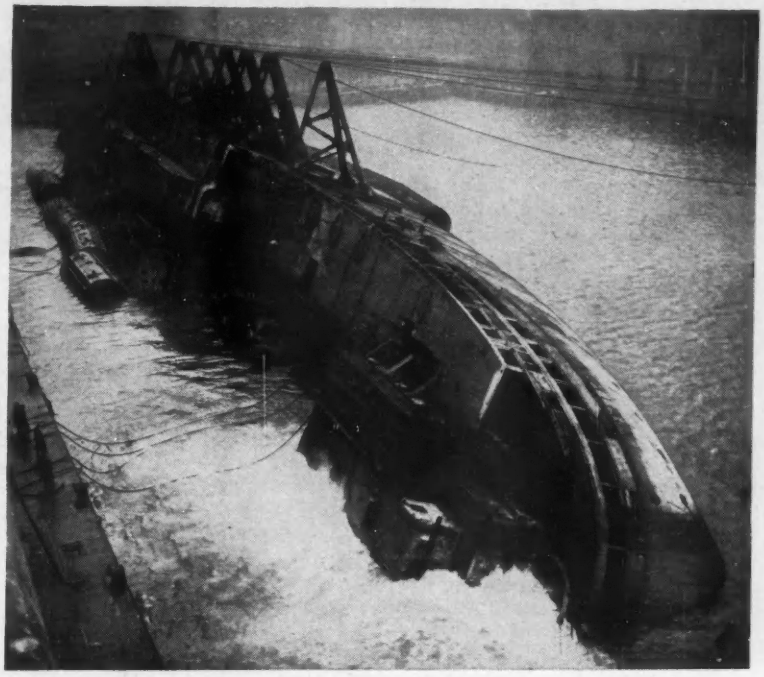
ELECTRIFIED ELECTRODES

Achieving a reasonable resistance from an earth electrode to the "general mass of earth" can be a difficult and costly business in some of the soils that electrical engineers encounter in this country. Even if the best earthing practices are adopted, excessive dryness of the soil may prevent the required resistance from being obtained, and then the engineer is faced with the greater expense of an earth leakage circuit-breaker installation, or other special measures to substitute for the simple precaution of protective earthing. It is in just such circumstances that the use of a small direct current to encourage the migration of resistance-lowering moisture towards the earth electrodes can be helpful. The promising results obtained in trials with this method, and described by H.M. Senior Electrical Inspector of Factories on page 504 of this issue, suggest that the method should be relatively inexpensive to operate, a current of only a fraction of an amp being required. Recommendation of the system from such an authoritative source marks it off as plainly deserving careful investigation, for it may well prove a valuable extension of earthing techniques.

Meteor

Lighting for Salvage





Special Lamps for Underwater Lighting

By L. H. PULFER, *B.T.H. Special Lamp Dept.*

ARTIFICIAL lighting is an important and often essential aid to the diver and the underwater television camera. Seeing conditions underwater vary extensively with the clarity of the water and the depth. Underwater vision in the turbid waters of estuaries, harbours and docks is usually bad, but beyond the influence of river silt seawater is often sufficiently clear for photographs to be taken by daylight at 150 ft. In clear Mediterranean water, experts state that at 300 ft there is enough light to work by and often enough to take black and white photos. For underwater television artificial light is not usually required during daytime at depths of less than 200 ft if the water is reasonably clear.

Particles suspended in sea water vary extensively in quantity and size with locality, depth and season. In the late spring minute animal and vegetable life can seriously restrict visibility and under these conditions artificial light is necessary in comparatively shallow water.

Of the light sources available for underwater lighting, tungsten filament and high pressure mercury discharge are currently the most popular. For work down to about 300 ft standard lamps up to 5 kW rating have been found to operate satisfactorily without modification. For greater depths special lamp design is needed.

In the search for the Comet in the sea off Elba, Mazda tungsten filament reflector spotlights were used with success as lighting equipment with both Pye and Marconi-Siebe, Gorman underwater television cameras. The sea-bed which was searched lies at a depth of between 400 and 700 ft below the surface and the water is reported to contain medium quantities of suspended matter, much of which is due to the disturbance by salvage operations.

Lighting on the Pye television camera consisted of a specially made Mazda 200 V, 250 watt grid filament E.S. reflector spotlight housed behind plate-glass in a duralumin pressure housing built into a fin attached to the camera shell. The lamp was made to the same dimensions as the standard Mazda 150 watt reflector spotlight and is identical in appearance. The supply cable is sealed in plastic inside a watertight flexible copper tube. The distance between the lamp and the camera lens is approximately 3 ft. Using a high sensitivity camera, only a low intensity of illumination is needed.

General lighting was used with the Marconi-Siebe, Gorman underwater television camera. A battery of Mazda 250 watt reflector spotlights, also specially made, are mounted independently in housings on spigots projecting from the camera in a circle slightly behind the camera lens. Lighting is adjusted to given an even intensity of illumination throughout the area.

Another Mazda lamp used under water is the Mazda Type ME high pressure mercury vapour compact light source. These lamps were used in underwater portable lamp fittings supplied by Messrs Underwater Sales Ltd. for use by divers employed in work connected with the righting of the Empress of Canada, pictured above. They are now being used for work inside the hull, preparatory to floating her. The lamps consist of a quartz arc tube containing two tungsten electrodes between which an arc of high brightness burns steadily, consuming 250 watts at approximately 67·5 V at the lamp terminals. The quartz bulb is mounted in a metal box with heat resisting glass windows through which the light emerges.

The lamp develops an intensive high brightness of some 20,000 candles per sq centimetre as compared with that of an ordinary tungsten filament lamp having a brightness of only 500 to 1,000 candles per sq centimetre. The optical system consists of two 4-in. diameter plano-convex lenses which produce a beam of high intensity emerging 4 in. in diameter and diverging very slightly to give a circle of illumination between 12 and 18 in. in diameter at 4 ft. The lamp casing is cylindrical in shape and made of bronze. The unit has been tested at depths of up to 150 ft, and in thick black muddy water where it increased visibility from nil to between 12 and 24 in.

Earthing in Practice

PART IV*—EARTH LEADS AND EARTH TESTING IN FACTORIES

By F. H. MANN, M.I.E.E., *H.M. Senior Electrical Inspector of Factories and Electrical Adviser to the Home Office*

WHATEVER system of distribution is used within the factory any metal sheath or enclosure which is used for its protection must be connected to the earth electrode, whatever the form it may take, or to the supply cable sheath, and this is the function of the "earthing lead." This conductor is part of the earth-fault continuity-path and must therefore be designed with due regard to its resistance, short-circuit-current-carrying-capacity, mechanical strength and resistance to corrosion.

Connections to an earth electrode, whether a water-pipe, earth spikes or plate, should be made in a position accessible for inspection and as free as possible from corrosive influences. Where the presence of corrosive liquids or vapours cannot be avoided the conductor and joints should be treated with appropriate anti-corrosive compound. In extreme cases recourse to phosphor bronze or Monel metal for the material of the earthing lead may be necessary. Clamps suitable for various types of continuity conductor are described in B.S. No. 951.

Where a metal-sheathed cable is used for the supply to a transformer situated on the factory site and the distribution within the factory is effected by a continuous metal-clad system, the function of the "earthing lead" between transformer case, secondary neutral point and earth electrode, as a means of conveying fault current, may be confined to sharing with the high tension cable sheath any high-tension leakage current, and stabilising the secondary system against inversion. In these circumstances it may be difficult, because of fortuitous earth contact along the path of the high tension cable, to estimate what proportion of the total high tension fault current will be carried by the earthing lead between transformer frame and earth, and it is wise to proportion this on the assumption that the total high tension fault-current possible at that point in the system may be carried. In the case of an overhead supply where no earth continuity conductor is used, no doubt would of course arise on this question.

In the case of installations where the short-circuit current is not a serious factor the prescription as to minimum sizes of earthing leads given in the I.E.E. Regulations may be relied upon. Where, however, the power is considerable and the setting of the protective gear on main circuits necessarily high, some consideration must be given to the proportions of the earthing lead where, as for example in the circumstances referred to in the preceding paragraph, it may be called upon to carry fault current. The temperature rise which will be attained in the time determined by the protective gear setting is usually adopted as the criterion, and the area of the conductor in square inches (A) can be calculated from the expression: $\frac{I}{A} = \frac{K}{\sqrt{t}}$ where I is the short-circuit current and K a value selected between 79,000 and 92,000 for a temperature rise between 120° C and 125° C respectively, and for 25° C ambient.

A similar calculation may be applied to the cable sheath and armouring where this, as forming the continuity conductor, may carry fault current; and on the basis of a temperature rise of 120° C the area of lead sheathing and of armouring is given by values of K of 10,000 and 20,000 respectively.

Cables Near Pipes

The following is an extract from a recent fire report—"Electrical short-circuit caused arcing from a conduit junction box to a compo gas pipe immediately adjacent. Escaping gas ignited by arcing."

The circumstances and the consequences are by no means unique and there is a record of other fires of varying severity from the same cause. The presence of pipes or vessels carrying inflammable fluids should be avoided in arranging cable runs. There are circumstances, however, in industrial usage where some sort of metallic connection between the two systems cannot be prevented, and in such cases the fortuitous element of contact should be removed by effective bonding at such intervals as to prevent appreciable voltage difference.

Similar precautions should be taken where control or other cables which might be affected by leakage from power cables are laid in their proximity. Such conditions are most likely to arise where switchgear control cables are laid side by side with power cables, and in these circumstances a local fault involving considerable differences of potential might well put the control system out of commission.

Transformer Inter-winding Faults

Regulation 20 of the Electricity Regulations requires that "where a high pressure or extra high pressure supply is transformed for use at a lower pressure, or energy is transformed up to above low pressure, suitable provision shall be made to guard against danger by reason of the lower pressure system becoming accidentally charged above its normal pressure by leakage or contact from the higher pressure system."

When the star point of the transformer secondary winding is earthed, as in the orthodox system of transmission, this requirement is satisfied; but in the case of transformers supplying insulated systems, and in other circumstances, such as arise for example with furnace transformers, where the lower voltage windings cannot conveniently be earthed, other methods of providing a discharge path to earth must be adopted.

Various expedients, of greater or less efficacy have been resorted to for this purpose and among them may be counted the use of breakdown devices such as paper discs or metal oxides, and potential relays have also found an application. On the whole the behaviour of breakdown

*Parts I and II of the series which were contributed by Mr R. W. Ryder appeared in the "Electrical Times" on 7th and 14th Jan. respectively. Part III by Mr Mann commenced on p. 393 of the issue of 18th Mar.

devices has been found to be erratic, and the stability of the arrangement can be improved by their use in series with such a device as a non-linear resistance, of which silicon carbide in its various proprietary form is a good example, since its performance can be predetermined. In selecting the type and grade of resistor for this purpose it is, of course, necessary to consider the conditions under which a breakdown can occur, and this will in turn involve a consideration of the type of high tension winding and whether this is earthed, and if so at what point. The aim must be to select a resistor such as will effect an extinction of dangerous voltage by operating the high tension protective gear. The high tension voltage which will produce minimum operating current for this purpose in its relation to the medium or low voltage value will clearly influence this selection, and will in fact determine the optimum conditions for such protection.

The Regulation does not stipulate that its requirements can only be satisfied by a discharge of energy from the secondary winding to earth, and it is possible to adopt other expedients, such as the inclusion between the primary and secondary windings of an earth shield. Nor does it apply below "High Pressure" (3 kV), but it is a requirement of the I.E.E. Regulations that the secondary should be earthed when the primary is connected to a circuit operating at a voltage exceeding extra-low voltage (30 V), and in some very small transformers, where efficiency and flux leakage are of little account, it is sufficient if the primary and secondary windings occupy different limbs and the core is earthed.

Welding

Welding is apparently such a simple operation that insufficient attention is sometimes paid to circuit arrangements: in fact the very facility with which an arc can be struck not infrequently leads to such neglect.

If, as is often the case, one pole of the transformer secondary winding, or generator winding in the case of d.c., is earthed and the object to be welded is earthed by contact with earthed structural work, or by other fortuitous means, contact between the welding electrode and the work will establish a circuit which, in the absence of a "welding return" (i.e. a direct connection between the "neutral" pole of the welding supply and the work), will involve any metal conductors in the path between the transformer or generator and work.

There are many examples, as a result, of the burning out of earth conductors on portable tools which have been lying about, and of damage to chain slings, wire ropes and other gear. Such vagrant circuits have also been responsible for causing fires, and in a recent instance where certain machinery parts were being welded on a conveyor belt, preparatory to being stacked for dispatch, a welder noticed that the welding of one component had not been completed and so tried his electrode on it. He found that he could obtain an arc, and so carried on welding the component which was in contact with a steel column. "Return" current appears to have travelled up the column to another column on the floor above, and then through bolts in a wood beam to a horizontal steel reinforcing beam, and back by building steelwork to the welding transformer. The wood beam caught fire.

The presence of the "welding return" referred to will prevent such effects, but to avoid the possible consequences of its careless omission it is often recommended that the transformer secondary winding should not be earthed, thus ensuring that the "welding return" cable is securely clamped to the work before welding is possible. This course, however, provides no protection against an inter-winding breakdown in the transformer, and although this is not required under Statutory Regulations for medium/low voltage transformation, the consequences of the exposed electrode holders becoming live at mains voltage may be so serious as to warrant the adoption of some safeguard against breakdown. An earthed screen between primary and secondary windings in the transformer is a practicable solution.

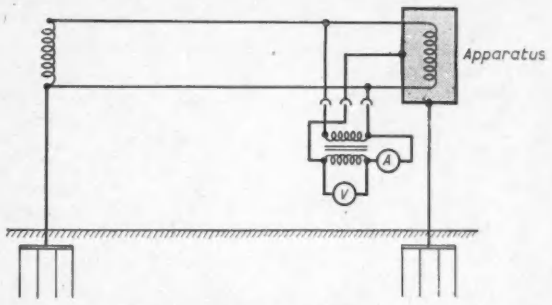


Fig. 10. Circuit for loop earth continuity testing showing single phase connections only

Fig. 9. Instrument for measuring the loop resistance of an earth fault current path

Testing

Whatever the means adopted for securing the requisite "safe discharge of electrical energy," their existence must be verified by tests designed to establish not only their effectiveness but the margin of safety provided. A mere functional test may not give us the latter information. The casing of apparatus can be deliberately made live so as to ascertain whether the fuse will blow. Such a test, apart from being dangerous, can, unless carefully timed, only give a reliable negative result, since if it succeeds we shall not know how near it was to failure; and if it was near to failure the time taken to blow the fuse will represent the period for which anyone in contact with the apparatus would be in peril. Tests must be quantitative if they are to be a reliable index of the efficacy of earthing.

Testing may be divided into two main categories: fundamental testing at regular intervals to ascertain that the impedance of the earth-fault-continuity-path in a system remains at a satisfactory value, and what may be called habitual testing, applied at more frequent intervals to earth-continuity conductors and earthing leads whose conditions of use render them more liable to failure. Examples are the earth cores to portable apparatus and earth continuity conductors exposed to corrosion.

It has taken many years for the necessity of testing the whole earth-fault-current-path to be realised, although an instrument designed for the purpose was available many years ago. The technique is now becoming better understood, however, and the proprietary instruments now on the market, one of which is illustrated in Fig. 9, leave no excuse for neglecting this essential measurement. In effect the instrument consists of a small transformer which can be plugged into any convenient socket outlet (with an earth connection) and which applies a low-voltage supply between this earth connection and the neutral conductor, an ammeter and voltmeter being included to indicate the current and voltage drop respectively. The test current path is via the neutral conductor to the substation and thence through the mass of earth or earth-continuity conductor back to the earth electrode or earthing point at the installation. This current path is described as the "earth loop," and the significant feature of this method of test is that it measures the whole loop and not the installation earth only.

Various modifications in the method of indication have recently been introduced in some instruments, but the principle of operation is unaffected. Such instruments are also adapted for taking measurements in other conditions. The testing circuit is shown in Fig. 10.

Mr Ryder has dealt with methods of measuring the resistance of earth electrodes and such methods are applicable in factory installations where, for example, an electrode is used for reasons of stability rather than as a normal part of the medium-voltage earth-continuity path. It is desirable that any test involving earth electrodes should be made in dry weather.

All tests results should be recorded so that any tendency of the resistance to increase unduly may be observed and the necessary action taken.

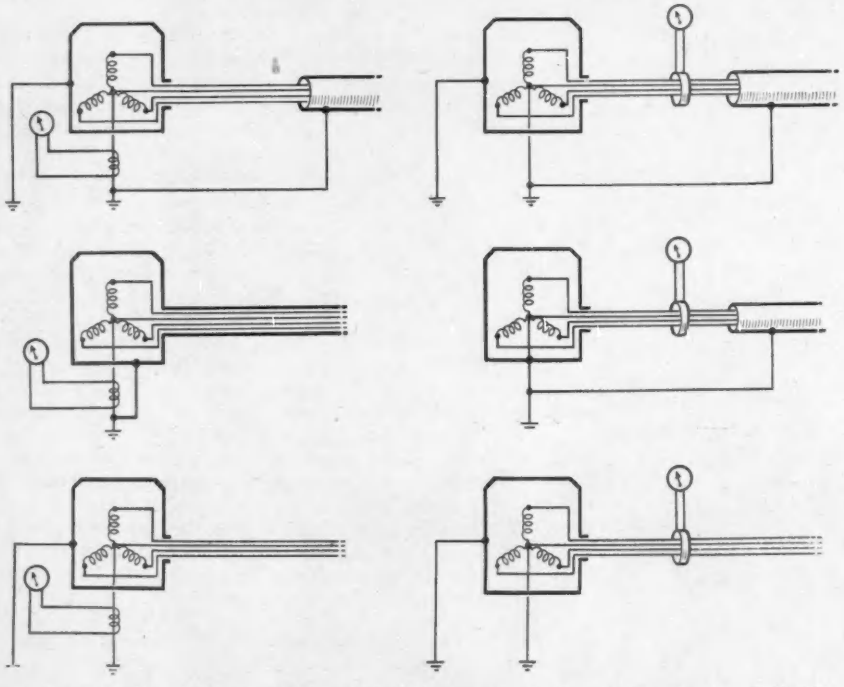
It has been found that the resistance of unsound conduit joints varies with the current used for testing and that a high value given by a light current is often considerably reduced when a heavy current is applied. Since where alternating current is used the impedance factor, which is, of course, largely independent of joint resistance, will arise, it is necessary that any tests of this character should be carried out with d.c. If the resistance obtained with a low current value is undisturbed when a substantially higher current is used, and is confirmed by a further low current test the jointing work may be regarded as sound. For the high current test 10 to 25 amps is usually found effective as a contrast to a low current test of about 4 to 5% of these values.

The importance of the integrity of continuity conductors on portable apparatus cannot be over estimated and the earthing cores should be tested at frequent intervals. Once the value of the earth continuity path to the socket outlet has been satisfactorily established by regular periodical tests it is only necessary to apply habitual tests between the plug and the apparatus, and a number of instruments are available for the purpose.

It is, however, desirable to check from time to time whether continual flexing has not reduced the number of strands in the earth core to dangerously few, and instruments can be obtained which will momentarily pass a heavy current capable of burning out the last two or three strands. A recording indicating "no continuity" will then be obtained.

Earth Leakage Indication

One of the disadvantages of unrestricted leakage protection, and I am speaking more particularly of its application to main circuits, is that an earth fault on a minor subcircuit may bring about its operation and as a result perhaps isolate an important section of the factory. Few installations run to the use of restricted protection, involving pilot wires, on medium-voltage circuits, and the possible consequences of installing the unrestricted type often leads to the rejection of earth leakage protection with all the advantages it can confer in reliability of operation under



Arrangements used where there are separate electrodes for neutral and transformer case (Metal clad system)

Arrangements used where neutral and transformer case share same earth electrode (Metal clad system)

Alternative arrangements for non-metal cased system (transformer case shown earthed by a separate electrode)

Fig. 11. Earth leakage indication. Various methods of connection are shown in these sketches. It should be noted that only the transformer secondaries are represented

indifferent earthing conditions and ability to isolate a fault before it has grown to serious dimensions or developed disruptive tendencies.*

As a compromise earth leakage indication is sometimes used, and in an installation of any importance this device, by indicating otherwise unsuspected leaks, provides an admirable check on the conditions prevailing at any time. Its possibilities can be judged by the example of a large installation in which a persistent leakage of 300 amps was disclosed by its agency! Leakage current is detected by much the same method as is utilised to operate the trip in the case of current-balance protection. The application differs according to the conditions and in general it consists either of a ring current transformer encircling the circuit conductors or a c.t. inserted in the earth lead from the neutral point, whichever is more convenient.

The various methods of connection are illustrated in Fig. 11. It will be seen that in the case of a metal sheathed cable or conduit installation the earth connection must be completed outside the c.t., otherwise any fault current carried would tend to compensate and thus neutralise the out-of-balance effect.

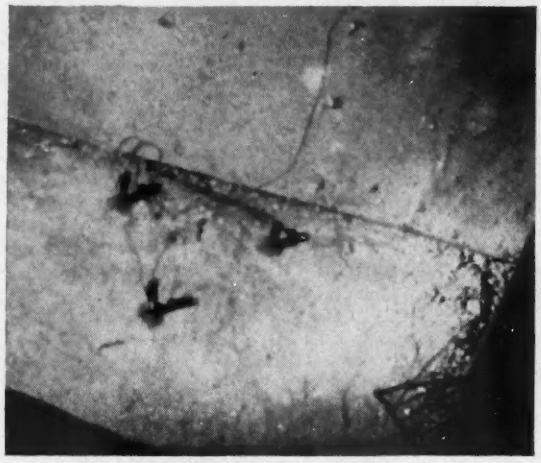


Fig. 12. The short spike electrodes seen here form the cathode group in the floor of a dry shed. The dark stains around each spike are caused by an accretion of water which acts to reduce electrode resistance

The connection in the earthing lead has advantages where it is desired to indicate the leakage at a number of points in the installation supplied by individual transformer, switching arrangements being made to change over each earthing lead in turn to the earth conductor in which the c.t. is connected without interrupting the ultimate connection to earth. The device can be arranged either to indicate or record earth-leakage current, or in addition, to operate an alarm. To avoid damage to the instrument the transformer is designed to saturate at a comparatively low current value, and thus heavy leakage currents do not give a commensurate indication.

By the use of current transformers with Mumetal cores, and a subsidiary a.c. circuit, responsive to the degree of saturation imposed by leakage current, earth leakage indication can be applied to d.c. systems although, for the reasons previously referred to in connection with earth leakage protection, there may in some circumstances be greater possibilities of a false reading.

Of recent years the number of processes involving the use of inflammable solvents or the presence of explosive gases has rapidly increased, and while the design of suitable

* *Some records of earth-leakage indication applied to factory installations are given in the* ELECTRICAL TIMES *of 17th August, 1950.*

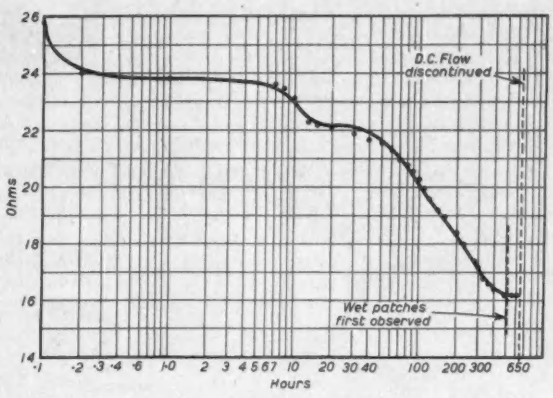


Fig. 13. Progressive reduction in electrode resistance as indicated by a.c. tests performed on apparatus shown in Fig. 12

electrical equipment usually presents no great problem, the procedure to be adopted in testing may require more consideration.

The tests with which we shall be mainly concerned are those to determine insulation resistance and earth continuity resistance, and fortunately testing apparatus is available which is certified as intrinsically safe† for both measurements, and for use in a number of the gases more commonly found in industry. The apparatus for the measurement of "loop" impedance is not, however, among these and should not be introduced into the danger area unless this has been tested and certified as "gas-free." In other circumstances the best procedure is to test the loop resistance from a point outside the danger area and then make an additional test of the continuity resistance within the danger area by means of one of the certified instruments available. Where such an instrument comprises a high-voltage generator it may safely be applied to a circuit of negligible capacitance; but as a precaution against sparking it is advisable that the terminals should be left connected for an appreciable time after completion of the test.

Within the danger area, flame-proof equipment will probably preponderate, and since this demands a high standard of continuity in order to ensure the reliable operation of protective gear and thus prevent hot spots, the "three-shot" method of continuity testing previously described would be particularly appropriate. Since, however, such testing is not "safe" in an inflammable atmosphere it will be necessary to await the time when the area can be made gas-free. A similar procedure must be adopted for the conduct of any other testing, e.g. injection tests on protective relays.

Conclusion

In these notes an attempt has been made to survey some of the more important aspects of earthing. Much has necessarily been omitted in the treatment of a subject which in its widespread ramifications is related to nearly every phase of electrical engineering but in conclusion it may be fitting to take a glance at the present position of the technique with its associated problems and try to form some conjecture as to where it may be leading us, or whither perhaps we may be able to guide it.

Considerable as has been the attention bestowed on the methods of installing earth electrodes, the difficulty of obtaining low resistance values at reasonable cost, especially in areas of high soil resistivity, remains with us. The problem is particularly acute as it affects factories in rural areas where neither water pipe nor earth continuity con-

† *A range of electrical apparatus for various purposes is certified by H.M. Chief Inspector of Factories as Intrinsically Safe (see Form 929 and 931)*

ductor on the supply system is available, and the unfortunate position which in many cases arises led some years ago to a consideration as the whether the electrolytic effect which has on occasion been utilised for the transfer of underground water could not be enlisted towards an improvement in the conditions. In this process a d.c. current is circulated between two groups of electrodes, and it seemed reasonable to suppose that the accumulation of water at the cathode brought about by ionic migration would tend to lower its resistance. A series of experiments by Mr Noel Elliott and the author, extending over several months, bore this out decisively.

Space does not permit of detailed records but it appeared that not only could the moisture produced be "held" at the cathode in dry weather, but that the lowered resistance so obtained would persist for long periods after the d.c. activating current had been switched off. Experiments with "salting" also showed that its effect could be intensified by the concentrating action of the electrolysis.

The photograph (Fig. 12) is that of the tops of three short spike electrodes forming a cathode group in the earth floor of a dry shed. The dark stains of approximately circular outline, which can just be discerned around each spike, were caused by the accretion of moisture after the current had been applied for about three weeks. No salt was used in this test. The reduction in electrode resistance, which was determined by a.c. measurements, is illustrated by the curve shown in Fig. 13, and it may be of interest to note that the d.c. current value averaged about 0·5 amp and the volts about 18, the energy consumed up to the time of switching off being 5·85 kWh. The resistance rose by only a negligible amount after 70 hours from the time of switching off. Other tests showed that once the resistance had been reduced its lowered value could be maintained by a much smaller current. This test is mentioned only as a typical example of the application of the cataphoretic phenomena to earth electrodes, and no attempt can be made here to pursue the strength at any length. The process is, of course, analogous to that of "cathodic" protection, and of the factors on which its commercial practicability would depend, the cost of the d.c. energy and of the expendible anodes can not, of course, be ignored. The indications from such exploratory tests as were made, however, suggest that these items would not be excessive, and the idea is put forward with the suggestion that its possibilities might repay a little research.

The form of protection which depends on low earth resistance (often attained only with great difficulty) with its necessary accompaniment of high and sometimes disruptive fault current values, may seem hardly to have kept pace with some other developments in electrical engineering. For small installations and a moderate level of short-circuit energy over-current protection may serve the purpose well enough; but as a means of isolating the preponderating earth fault on heavy circuits it may be regarded as leaving something to be desired.

We have already noticed the objection to unrestricted earth-leakage protection in its lack of discrimination, but little attempt ever seems to be made to overcome this by a more imaginative proportioning of the circuit elements. The application of earth-leakage protection to circuits supplying one item of apparatus present no problems; the difficulty arises when a main circuit, equipped with such protection, is broken down into a group of sub-circuits. Such circuits will usually be protected by fuses, and if the blowing current of the fuses is less than the operating current of the earth-leakage trip, and the latter is time lagged to match if only in some degree, the time characteristic of the fuses, the tendency will be for the fuses to operate first. Not infrequently the ratio of operating current between the earth-leakage trip and the fuse can be adapted to the practical requirements of an installation.

This suggestion may be criticised on the ground that once the instantaneous character of earth-leakage protection has been surrendered by time-lagging much of its virtue is lost. As a truism this must be admitted, but since the time factor in the modern fuse declines steeply as the current increases, tending therefore to rapid clearance, the method suggested still provides a means of isolating a fault at a fraction of the current value inseparable from over-current protection. It might, however, with justice be asked whether, in view of the rapid advances in light current engineering, a degree of sensitivity in protective gear performance should not be contemplated such as would respond to incipient fault conditions and thus effect isolation with a complete absence of the disturbance which often accompanies the operation today. Discrimination may present problems, but there would appear to be no insuperable difficulty in the monitoring of insulation values, implicit in the application of such a system, just as earth resistance values can be monitored in the case of circulating current protection and we may perhaps venture to speculate on the possibilities of electronic detection in conjunction with some means of sectionalising the insulation, as, for example, by capacity grouping, for the protection of vitally important circuits whose function might in some degree be impaired by cruder methods.

In the meantime it is perhaps not unreasonable to hope that this principle of automatic supervision may be extended to a type of earth fault protection tolerating a relatively high earth resistance value in such a way as to enable the device to keep it under surveillance and operate at some critical and predetermined value irrespective of the incidence of fault. It is perhaps in the field of portable equipment that such an elegant solution would find its most appropriate application.

REFERENCES

The Electricity (Factories Act) Special Regulations 1908 and 1944. E.R.A., V/T 109. The incidence and avoidance of high resistance joints in steel conduit runs in service (Gosland and Hutchings); E.R.A., V/T 111. The impedance of steel conduit used as an earth-continuity conductor (Butterworth and Gosland); E.R.A., V/T 114. Testing of earth-continuity conductors (Shotter and Elliott).

Station Efficiencies top 30 per cent.

FOR the first time, the annual return of the twenty most efficient B.E.A. steam generating stations includes stations showing better than 30% efficiency. As the table below shows, three stations achieved this distinction in 1953 and they contribute towards an overall efficiency figure of 23·22% for the 300 or so stations which the Authority operates. The previous year's average efficiency was 22·62%, and the improvement represents a proportional increase of 2·7%, and a saving in the annual coal bill of over £3m.

Station	Effcy.	Station	Effcy.
Portobello H.P. ...	30·86	Uskmouth	28·21
Stourport B... ...	30·40	Huncoat	27·86
Dunston B II... ...	30·07	Poole...	27·46
Littlebrook B ...	29·68	Agecroft H.P. ...	27·37
Bromborough ...	29·10	Staythorpe	26·71
Skelton Grange ...	28·76	Blackwall Point ...	26·63
Brunswick Wharf ...	28·62	Keadby	26·61
Braehead	28·61	Stuart Street H.P. ...	26·52
North Tees C. ...	28·53	Cliff Quay	26·49
Battersea B.	28·24	Clyde's Mill H.P. ...	26·42

In addition to the stations mentioned in the list, there are five others which came into operation after 1st January, 1953, and which had high efficiencies. They are: Barking C H.P., 28·62%; Carrington, 27·83%; Littlebrook C, 27·65%; Carmarthen Bay, 27·53%; Brighton B, 27·44%.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Interlocks and Safety

FURTHER to the correspondence between "Steelworks Electrical Engineer" and Mr J. W. Lowe, it would appear that the "Steelworks Electrical Engineer" has had the misfortune to be associated with an incorrectly designed system of interlocks. The two dangers referred to in his article "Planning a Works Distribution System" (ELECTRICAL TIMES, 18th February) do not apply to any correctly designed scheme using key interlocks.

With any such system of interlocks it is necessary for a certain key to be associated with the mechanism of any switch before it can be operated. The key is only obtainable under switching conditions that are safe to allow that particular switch or isolator to be operated. Emergency conditions that are referred to are just those conditions when interlocks are essential to safeguard against the fatal consequences of tiredness and familiarity of equipment.

The danger of a scheme being so complicated as to require special training of staff and causing considerable operational delays is non-existent when a system of interlocks is intelligently designed. Any operating engineer knows that a switching operation must be carried out to a definite sequence and it is to this sequence that an interlock scheme must be applied. The delay in carrying out an operation can be no more than that required to remove a key from one lock and insert it in another lock: surely no more than one minute.

Some engineers will claim that an interlock system does not allow for the maintenance of apparatus as it is usual for isolating switches to remain locked open. This, however, is not the case as under the controlled condition of access being available to both sides of a switch, it is safe to maintain that switch. It is then possible to arrange for a maintenance key to be obtained.

The real danger to a key system of interlocks is from certain "ham-fisted" types of operator who can maltreat practically any type of control apparatus so as to cause distortion to the mechanical parts. If the system has been correctly designed the use of a master key does not arise and any operator found in possession of such a lethal device should be the recipient of severe disciplinary action.

"Chartered Electrical Engineer."

LONDON.

Unearthed Neutral Systems

I WAS very interested to read the comments of "B. C. (Eire)" regarding operation of medium voltage systems with an unearthed neutral, as I have been concerned with a considerable number of such systems in one factory with separate step-down transformers and supplying over 2,000 motors. The system was not inaugurated by me, but I have had extensive experience of it and can only speak well of it. Frequently the process, which is a continuous one, has been kept in operation despite an earth fault, which with an earthed neutral would have meant a shut down. Despite many warnings about transient over-voltages and such like, I can only say that breakdowns to earth are rare, keeping in mind the extent of the cabling and equipment involved. Our practice is to earth and bond just as strictly as if the star point were earthed; always to use the best equipment and to install 660 V grade cabling—the little extra cost of which is well worth while in any case. Further, strict supervision and proper installation ensures that the risk of unauthorised or accidental contact with live conductors, one of which may be at line volts to earth under earth-fault conditions, is practically eliminated.

Regarding means of warning that an earth fault is on one of the three-phase systems, regular inspection is made of well known earth indication instruments. We have, too, developed an audible warning system, utilising suitable sensitive relays to replace the voltmeters mentioned by "B. C." or a single high resistance relay in an artificial star neutral. Test lamps are used for location as "B. C" relates. They are, of course, only an approved type with h.r.c. fuses, a point which needs continually watching at all times. I have taken the question up with the Factory Department of the Ministry of Labour, and they do not feel justified in calling for earthing the neutral so long as no subsidiary lighting voltage is derived directly from the system, which brings me to the point that "B. C." does not refer to lighting supply. In my case this is entirely separated from the power system, and is supplied from a large number of separate transformers with 110 V centre-point-earthed secondaries. Thus with the large number of portable leads and tools in a wet industry the voltage is limited to 55 V to earth, and reports of shock are practically unknown. Earthing in this case is entirely justified, and the only danger to the process is a lighting failure. With proper circuit arrangement this will be very limited.

Gamma.

KENT.

WITH reference to "B. C.'s" article in the 25th March issue of the ELECTRICAL TIMES, in which the pros and cons are weighed for earthed or isolated neutral, the following observations may be helpful.

While the neutral point automatically assumes earth potential with balanced loads, the potential of the star point varies considerably from earth with unbalanced conditions. The resulting unbalanced voltages throughout the system can be quite alarming.

Insulation is subjected to more stress with the neutral unearthed, a point which "B. C." has already considered, but nevertheless a vital one.

One hesitates to condemn a system that has operated satisfactorily over the past twenty years but I would strongly recommend tying those generator star points down to earth. One of the main reasons against doing so was the possible heavy fault current that could flow. This could be limited by inserting a resistance in the earth connection from the star points of each alternator.

S. Arnold.

DOVER.

Glasgow Railway Electrification

YOUR "News of the Week" mention of the above, under the title of Appeal for Electrification of Glasgow Railways, should surely start "appalling." As an old railway engineer who had many years happy service when railways were run as "railways" and were in fact gilt-edged securities, I know that this particular job was reported on by the best consultant in the profession and would have been done but for the first World War. It is, I see, now to be studied again!

Is it any wonder that the Swiss Railways have long since been completed, and France is well on the way with records of 150 m.p.h. whilst we still talk?

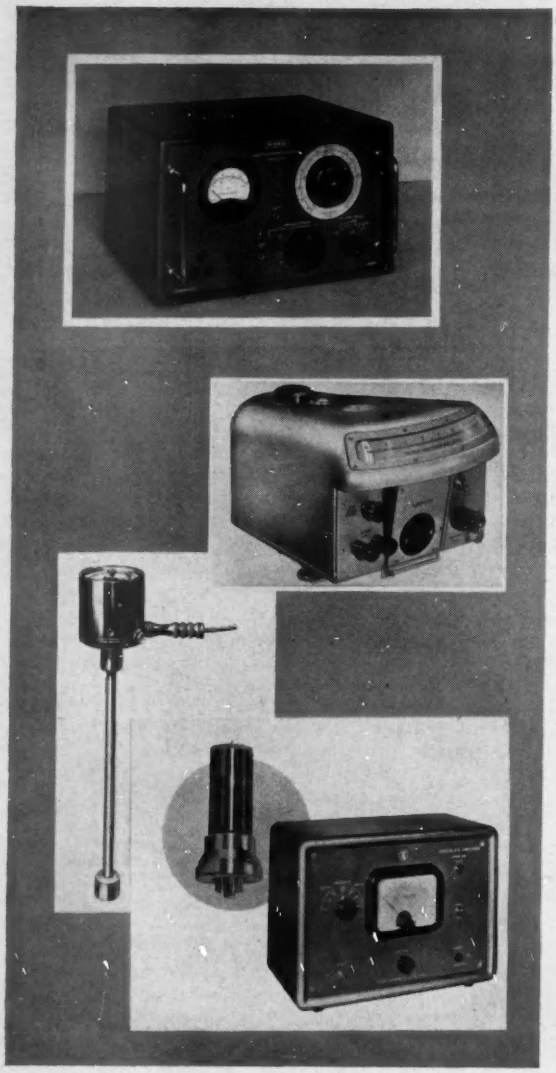
A. V. Summers,

LONDON, N.W.1.

38th Physical Society's

A REVIEW OF SOME INDUSTRIAL AND RESEARCH EQUIPMENT

The Muirhead D669 selective amplifier detector which can be used as a harmonic analyser with, below, W. G. Pye's Scalamp Fluxmeter



Left is Ferranti's portable viscometer with extended cylinder and below, the new E.I.L. vibrating condenser d.c. amplifier. This amplifier developed by Electronic Instruments Ltd. of Richmond sets new standards of accuracy in the measurement of small d.c. currents and voltages

REGULAR visitors to this year's Physical Society's Exhibition which opens at Imperial College, South Kensington, today, will notice a considerable change in the tenor of exhibits. Many well-known regular exhibitors have been, due to pressure of space, relegated to a description in the catalogue, of the items they would have exhibited had not the accommodation been so restricted. Among them are the Automatic Coil Winder and Electrical Equipment Co., whose "AVO" series of meters is well known to the electrical industry. Everett Edgcumbe and Co., Ltd., and Sangamo Weston are two further well-known firms who are unable to exhibit their products. Also non-exhibitors are A.E.W. Ltd., manufacturers of electric furnaces; Telegraph Construction and Maintenance Co., Ltd., who are continuing the work on special alloys for the electrical and instrument industries; and Measuring Instruments (Pullin) Ltd., who have developed a small and compact capacity and resistance bridge to meet the demands of the radio and television service engineer. Despite these, and several other omissions, there still remains a wealth of interest in the exhibits shown. In the following review we give a selection of those items which may be of particular importance to the electrical industry, although due to space considerations we have been unable to describe much of the radar, radio and nuclear physics equipment which is available.

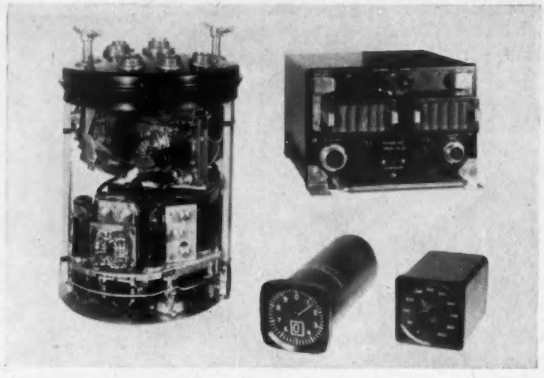
Industrial and Commercial Equipment

Starting, therefore, with those items which have a direct application to production or industrial techniques, it is noteworthy that the problem of thickness measurement is still exercising the ingenuity of many firms. Salford Electrical Instruments, for example, have developed a miniature layer thickness meter which deals with the depth of non-ferrous layers on a ferrous base. It may be used to measure non-ferrous layers on all types of iron base material from low grade cast iron to high grade electrical sheet steel. Layers of copper, zinc, brass, aluminium and magnesium alloy may be dealt with, but the instrument is not suitable for nickel plating. It can, however, be used with enamel and plastic films. The measurement is performed by the measurement of the reluctance of the layer, and by using a solid steel base, it can be applied to the measurement of paper, paper board, plastic film, leather cloth and so on. Ranges of 0-5, 0-10 and 0-30 thousandths of an in. are available. Another thickness gauge incorporating automatic standardising, but utilising radio-activity absorption is by Ekco Electronics. In this case a servo mechanism is employed to correct for source decay and contamination, sensitivity and amplifier zero. The standardisation takes place every 30 minutes. An X-ray thickness gauge by the Baldwin Instrument Co. covers a range of 1/16 to 1 in., with an accuracy of the order of 1% up to ½ in. steel but a somewhat lower accuracy for thicknesses over this. The tube equipment and detector can be

Exhibition in London

SHOWN AT IMPERIAL COLLEGE

Ekco Electronics built this antenna Pattern Recorder E.59, and below the Salford Electrical Instruments Radio Altimeter measures the direct height of aircraft from the ground



arranged for water cooling if it is desired to measure thicknesses on hot rolling mills. Ultrasonic methods of thickness measurement are shown by Dawe Instruments Ltd., who have produced a high-frequency gauge especially for thin materials in the thickness range of 0·02 in. to about 0·2 in. This is similar to the previous gauge which covered the range 0·6 to 12 in. but operates on a frequency lying between 2 and 6 Mc/s instead of 0·65 to 2 Mc/s in the original instrument. The application of ultrasonics to cleaning of precision components is well shown in Mullard Ltd.'s demonstration. Here the activity of cleaning baths is greatly increased by irradiation with ultrasonic vibration. For removing contaminants which are in the nature of an adherent film (as is the case when cleaning lenses) a frequency of 25 kc/s is used obtained from a magnetostrictor. If the problem is to remove relatively loosely held particles from inaccessible places (as is the case when cleaning ball races and similar components) frequencies of the order of 1 Mc/s are obtained from a quartz crystal transducer.

A further interesting item at Mullard's stand is the high-power ultrasonic drill for machining brittle materials. The tool is a reciprocating type, using a high Q magnetostriction transducer to generate vibrations of 15 kc/s, which are transmitted, via a tapered metal stub which acts as a velocity transformer, to a tool tip screwed into the end. An abrasive paste is fed to the tool tip, and the hole produced can be of any shape which can be formed on a mild steel tool tip, the maximum lateral dimension of which is 2 in.

Counting

Counting is also a subject to which considerable attention has been paid over the past few years. Much of this work has been done in connection with the counting of impulses from Geiger counters in radio-activity measurement. Certain items are, however, of direct industrial application.

The electronic counter Type 851, by Airmec Ltd., represents an attempt to design an electronic counter of sufficient reliability to operate under really arduous industrial conditions. Up to three electronic dividing units can be fitted and these may divide by 10, 12 or 16, the output from these units being fed to a resettable 6 figure electromechanical counter. Maximum counting rate of the dividing unit is about 2,000 per second and of the electromechanical counter is 10 per second. Power supplies are included so that the counter may be operated directly from photocell equipment.

Add-on counting equipment has been designed by Ericsson Telephones Ltd., with a view to providing an inexpensive yet versatile electronic counting device suitable for a number of industrial, academic and nucleonic applications where fast counting rates are not required. The equipment uses Ericsson Dekatron counting tubes. The same firm is also exhibiting a batch counter for counting a preselected number of articles.

Counting, though of a different nature, is provided by the Plessey precision electronic tachometer. This has been developed for precision measurements and is self checking in terms of its own frequency standard which can be referred to standard time. Four decades are employed and with suitable input equipment accuracies up to 0·025% can be obtained. Various input devices are available to convert rotary motion to a frequency input necessary for the equipment. The tachometer displays the number of pulses per second on a four decade Dekatron counter and the display is held for approximately 700 millisecs, after which the counter is automatically set to zero ready for the next second count. Alternatively a switch on the front panel permits a count to be held if required.

Although not associated directly with industry, the protective remote control circuits for mining switchgear, exhibited by the National Coal Board, are of interest. These employ a combination of sequential relays operated by a remotely placed pilot switch connected by a single pilot conductor with an earth return. The current used is sufficiently low to prevent any accidental firing of detonators, and is safe in mine gassy atmospheres.

For measuring forces ranging from 5 cwt to 200 tons are the load cells produced by Elliott Bros. These compact units operate by causing the applied force to stress a high

tensile steel member carrying bonded resistance wire strain gauges connected in a bridge arrangement. The load carrying member is housed in a hermetically sealed cylindrical container provided with a cable entry gland. Load cells are self-compensating for temperature variations, and calibration is within ± ¼% of full range at all points from 0-100% of capacity. Physical dimensions vary according to ratings, but the average diameter and height is about 4 in. Typical applications of these cells include measurement of roller pressures in calenders and rolling mills, measurement of pressure in rams and presses, tank weighing, axle loading, batch measuring, etc. The bridge is excited from a low voltage source and provides an out-of-balance signal of 2 mV per volt input to the bridge. A self-balancing bridge load indicator is available for use with the load cells.

A wide range of industrial problems can be solved by the use of the Edison Swan industrial servo unit type 1219. The unit is supplied for 19 in. rack mounting and is self-contained except for the d.c. servo motor. Performance is, of course, governed by the motor characteristics but a maximum torque of 7·5 oz-in. is available and the speed can go up to 5,000 r.p.m. on no-load. Positive or negative error voltages can be accepted and balance is against internal d.c. voltage references. Adjustment of sensitivity and velocity feedback can be made by pre-set controls, and connection and resistor mounting positions are available for various input control arrangements.

Examples of a patented type of SenTerCel rectifier construction can be seen on the stand of Standard Telephones and Cables Ltd. This type of construction caters for conditions of extreme exposure. The individual plates of these rectifiers are, "encapsulated" within a sealed aluminium case. Principally, these units are designed for open-air marine installations, for road vehicles, and for use wherever moisture-laden cooling air passes over the rectifier plates.

It is frequently convenient, when investigating certain types of phenomena, to express the results on a logarithmic time scale. An apparatus shown by Metropolitan-Vickers Electrical Co., Ltd., has been devised to drive the chart of a Kent Multelec recorder according to the logarithm of time, covering the period from t=25 seconds to t= 100,000 seconds. Although the mechanism has been used for the study of isothermal transformations in steel, it may be of more general interest as a method of driving a recorder chart according to any desired function of time.

Test Equipment

As usual there is a wide variety of test equipment, much of it for radio frequency and nucleonic measurements, on view. While this is of great importance as far as these fields are concerned, it does not affect the electrical engineer to a great extent. Certain instruments, however, may prove most useful to the research and test departments of firms. Among these is a portable fluxmeter by Salford Electrical Instruments Ltd. which is designed for the exploration and determination of magnetic fields. The scale of the instrument is graduated in flux linkages and is 6 in. long. With a normal range of 10,000 flux linkages per division and a scale of 60-0-60 divisions, fluxes up to 1·2 megalines may be determined. The reading is practically independent both of search coil resistance and of rate of change of flux linkage.

For the measurement of high resistances, is the Myria Megohmmeter Model 25A, made by Electronic Instruments Ltd. This portable general-purpose, direct reading megohmmeter is mains-driven, covers the range 150,000 ohms to 200,000 megohms, and has an accuracy of 1-2%. Test voltages of 100 and 500 are provided.

The well-known range of "Megger" insulation testing sets has been augmented by a 10 kV main-driven unit, with two scales, one covering 60-200,000 megohms, and the other a range of zero to 1,000 megohms. Special precautions have been taken on this instrument to avoid errors due to brush discharge, and an automatic switch is provided to disconnect the test terminals from the instrument, and to short-circuit them when the mains supply is switched off. Evershed and Vignoles, makers of "Megger" insulation testing sets, are also exhibiting a 5,000 V mains operated unit, which has subsidiary ranges of 1,000 and 2,500 V.

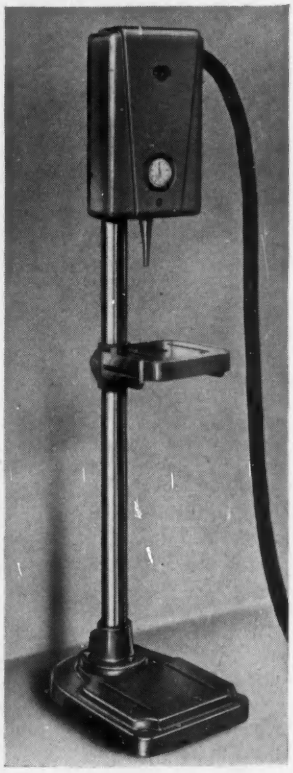
An unusual instrument is the Duo-Meter universal test set by British Physical Laboratories. By utilising two independent movements, each with its own multiplier, simultaneous measurement of voltages and currents is possible. The d.c. volt range (20,000 ohms/volt) goes up to 2,500, while a.c. volts (1,000 ohms/volt) can be measured up to 1,000. Both a.c. and d.c. current measurements are possible, the ranges being 50 microamps to 10 amps d.c. and 10 milliamps to 10 amps a.c. A resistance scale with three ranges, 0-10,000, 0-100,000 and 0-1 million ohms is also incorporated.

Stability and Power Supplies

Several firms are exhibiting stabilised h.t. and l.t. power units. Joyce Loebl and Co., Ltd., have a universal dual-channel stabilised h.t. power unit, which consists of two identical but completely separate h.t., d.c. channels, electronically stabilised over the range of 120-420 V at 0-250 mA d.c. The two channels can be connected in series or parallel, and in the latter case, the load is equally shared between the two channels and a current of 500 mA can be drawn. The same company is also producing a low voltage power unit for laboratory use which provides any a.c. or d.c. voltage within the range to be obtained and will provide currents up to 40 amps.

A frequency - independent voltage stabiliser is produced by Philips Electrical Ltd. This has an input voltage range of 180-250 V at frequencies varying from 47-51·5 c/s. The rating is 150 VA and the output voltage 220.

Automatic voltage regulation is provided in a unit by Cinema - Television Ltd., which can give a predetermined output voltage irrespective of changes in input voltage or load. The output voltage is nominally 230 V, and the out-



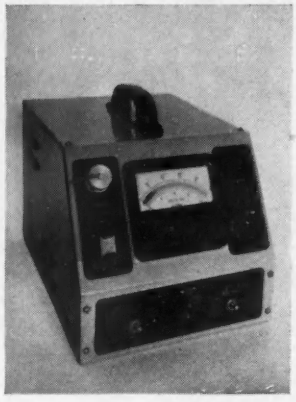
The Mullard ultrasonic drill is particularly suitable for the drilling of fragile material

put current has a maximum value of 15 amps. Sensitivity is ± 1%, and the correction rate 6 V/sec.

Another type of voltage regulator, the American Sorensen type, is now being built in this country under licence by J. Langham Thompson Ltd. These have wattage ratings of 150, 250, 500, 1,000, 2,000, 3,000 and 5,000 watts and up to 15 kVA per phase, and a regulation accuracy of 0·1% is achieved. Input voltage may vary between 190 and 260 V and the output may be set between 220 and 240 V.

For the direct plotting of Nyquist diagrams of high-speed servo mechanisms, feedback amplifiers and passive networks, as well as for providing separate indication of core loss and magnetisation VA in transformer cores is a phase sensitive voltmeter by Solatron Laboratory Instruments Ltd., which indicates simultaneously on two six inch centre-zero meters the in-phase and quadrature components of an applied test voltage with respect to a given reference voltage. The meters provide direct indication of the resolved components in vectorial form with a 2% accuracy.

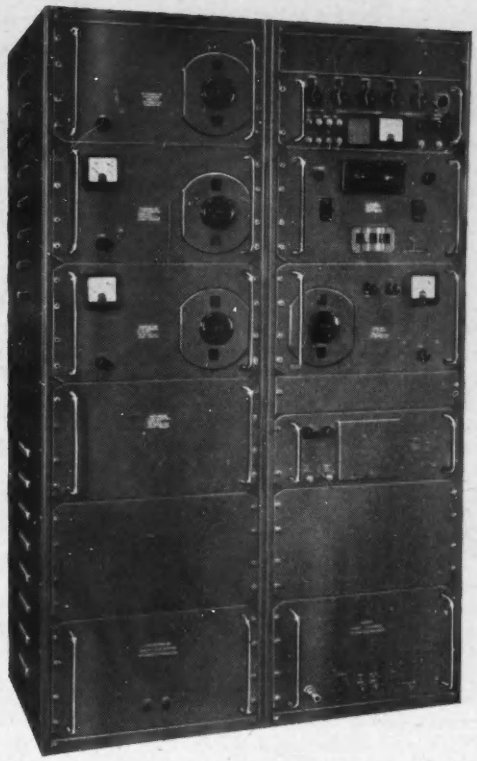
A large proportion of the equipment to be seen is devoted to research. The General Electric Co., for example, have a recorder which is able to accept d.c. input voltages proportional to two variables, and plot a curve representing the function of one of the variables against the other. Two servo mechanisms are used, one of which drives the drum carrying the chart paper, and the other driving a ball-point pen in a direction parallel to the axis of the drum. The paper size is 40 cm. × 30 cm. and the performance of the servos is such that the dead zone is less than ± 0·2 mm. The linearity is within ± 2% and the scaling accuracy can be within ± 1%. The speed of response is such that a step of 35 cm. is completed in from 0·5 to 0·7 sec depending on the gear ratio in use. A demonstration will show the recorder in use with an attachment for plotting valve characteristics. Newton Victor have the Raymax 60 X-ray crystallographic unit, which is a 60 kVp diffraction apparatus of a new design, featuring a "unit" system of construction, the purpose of which is to make available basic crystallographic facilities at minimum initial cost, but with provision for subsequent extensions as required.



The Hyzee electrometer voltmeter by Baldwin Instrument Co. has an input impedance of about 10^{13} ohms and measures up to ± 500 volts

Another tool with great potentialities is the Cintel Flying-spot microscope, which is capable of producing a picture of high definition and large magnification. Advantages of this equipment are that several monitor tubes can be used and that if necessary the final picture can be displayed on a screen with dimensions of 20 ft by 16 ft. Magnifications of from 350 to 6,400 times can be attained.

Siemens Lamps Research Laboratories are showing several items mainly connected with the development of fluorescent lamps. A new instrument is a visual colorimeter for fluorescent lamps, which has been mainly designed for routine testing purposes. On the same stand can also be seen demonstrations of other fluorescent lamp phenomena. Electroluminescence forms the subject of a demonstration by the Research Laboratory of the British Thomson-Houston Co. This shows that the spectral distribution of the radiation may be made to change with the frequency of the applied alternating field.



This frequency synthesiser by Plessey gives any one of a possible 100,000 frequencies in multiples of 1 Kc/s in the frequency range of 1 Kc/s to 100 Mc/s

This may be explained by considering that the dielectric constant in the material around different impurity centres changes with the frequency. At low frequency, the greater stress, and the greater emission, occurs around the green band impurities while at high frequency this is transferred to the blue.

General Items

Among items of general interest are the electrically conductive glasses produced by Megatron Ltd., and the demonstration of contact phenomena and their investigation given by the Physics Department of University College, Swansea. Components for analogue computors are shown by Elliott Bros, and a mechanical heat-flow analyser for the treatment of one-dimensional transient heat-flow problems is being exhibited by the Armament Research Establishment.

Mullard Ltd., have a cathode-ray-tube flying-spot scanner which examines dust samples via a suitable optical system, and the signals are integrated so that each particle is counted once only. The size of particles for which the counter was designed lie in the range of 1-20 microns, but the equipment will count any microscopic particles greater than 1 micron.

A demonstration of Xeroradiography can be seen on the stand of Ferranti Ltd. It may be recalled that this involves the production of photographs electrically on selenium plates for use with industrial and medical radiographic investigations. Positive or negative radiographs can be obtained in less than a minute from exposure. An electrostatic image builds up on the charged plate during exposure and this can be made visible by dusting it with charged powder. The plate may be made ready for use again by wiping it clean and re-charging.

The Cross-Channel Link

Present Progress on the Project Described at I.E.E.

SOME time ago, in our issue of 21st August, 1952, we published a brief account of the preliminary considerations involved in the design and operation of the proposed cross-channel cable. Further details of the progress of this scheme were given last week by Messrs D. P. Sayers, M. E. Laborde and F. J. Lane in a paper "The Possibilities of a Cross-Channel Power Link between the British and French Supply Systems" presented to an Ordinary Meeting at the I.E.E.

The paper began by giving a brief history of underwater cables and cable laying, and then carried on to a description of the British and French systems. On the B.E.A. system, 99% of the energy was produced by thermal stations, while in France, in 1952, 55% of the energy was generated by hydro-power. Had that year been one of average rainfall, this proportion might well have reached 62%. Other important differences were that the French variation between summer and winter demand was much less than in this country and the maximum demands occurred at different times. This latter feature was due to the differences in climate, habits, national standard clock times, hours of work, industrial, commercial and domestic uses of electricity and response of demand to weather conditions. With adequate interconnection between the two countries the total generating capacity required in the two countries to meet the combined simultaneous maximum demand for electricity could be reduced. Both systems, however, operated at 50 c/s, although the standard voltages were different. In any link, therefore, it would be necessary to have transformers at one end or the other.

Preliminary Studies

Preliminary work indicated that the initial capacity of interconnection should not be more than about 400 MVA when operating at 275 kV, and not less than 100 MVA at 132 kV. Subsequent studies were consequently directed to the possibilities lying between these limits. The potentialities of high voltage d.c. transmission were also considered, but taking into account the immature state of development of conversion equipment and other problems, such as the external magnetic effect and corrosion phenomena, it was concluded that h.v., d.c. was not at the moment practicable, but the possibility of a large scale d.c. experimental transmission using a spare single-core cable merited serious consideration.

As more data were required on the risks and techniques associated with a cable-laying project of this magnitude, and in view of the technical problems which would arise in the design of submarine cable for voltages higher than 132 kV it was decided that a programme of development should be started covering the production, testing and installation of sample lengths of 132 kV cable, methods of surveying the route and of laying the cable, and such associated problems as localisation of faults and repair technique, the interconnection capacity being fixed at an arbitrary figure of about 100 MW.

Design Factors

Bearing the preceding considerations in mind, together with an appreciation of some of the difficulties likely to be encountered during the laying operation, the following important points of design were deduced. First, the number of joints to be made at sea during laying should be kept to a minimum, and, if possible, eliminated altogether. Second, if the cable were to be laid as a complete unit, it would be necessary to develop a works joint which would have electrical characteristics and mechanical flexibility closely similar to those of the main cable. Third, a design of joint of a rigid type should be undertaken for coping with repairs at sea, to cater either for damage during laying or breakdown during service. This joint would have to be suitable for rapid and efficient completion in conditions dictated by the limited dimensions and facilities of a ship and the state of weather and sea. Fourth, the armouring should be able to give maximum protection against mechanical damage, and at the same time must be able to resist chemical attack from sea water. Fifth, special consideration would be needed with regard to the terminal lengths on the foreshore and land, as the current rating would change with the transition from water to land. Sixth, the cables would have to be laid about 1,000 yds apart, to provide adequate clearance for successful grappling, and finally accurate fault location would be of great importance.

Cable Types

Several types of cables were considered, and after careful consideration of all the factors involved it was finally agreed that works development tests and laboratory and sea trials should be carried out on two types, namely the gas-filled pre-impregnated cable and the gas compression cable. The decision was also taken to use four single-core cables, one as spare.

In Britain, it was thought that the gas-filled pre-impregnated cable would be the more suitable, and investigation was therefore confined to this type. In order to survive the severe handling a copper section of 0·5 sq in. was selected, and the radial thickness of the paper insulation was taken as 0·5 in. on the basis of a maximum stress of the conductor of 90 kV/cm and a screen stress of 41 kV/cm. To avoid the effects of vibration, the lead sheath was to be of alloy E, and to prevent collapse under the water pressure of 100 lb/sq in., the sheath was fixed at 0·14 in. thick.

A works development programme was initiated, and sea trials began. These were carried out between 21st July and 9th September, 1953. Two lengths of British-made cables and one length of French cable were laid in series running altogether some 2,060 yds out to sea from the Shakespeare colliery. Following the tests and successful energising at 300-400 kV d.c., the cable and joints, both of the flexible and of the rigid types were recovered and taken back to works for examination.

In France, two types of cable were investigated; gas-filled pre-impregnated type and external gas-compression. As the British tests had been carried out on the former, it was decided to carry out French trials on the latter. Various preliminary tests were first carried out at the manufacturer's works and at the Fontenay high voltage laboratory. Sea trials however were located at Boulogne-sur-Mer. Each of the four manufacturers provided a test length of approximately 120 yds. These were jointed in a factory with three flexible joints and the whole length armoured in one operation. A stop joint was made at one end, and the section laid out to sea. After voltage and

thermal tests, two additional lengths of cable, to the same specification, each about 540 yds long and including one flexible joint would be jointed together beforehand and laid as an extension of the existing cable. After final tests at 600 kV, the cable and joints would be recovered and returned to the factory for examination.

In view of the small capacity of the link compared with the installed capacity of the two associated systems, it was necessary to be able to predict the fluctuations likely to occur in practice and the degree of control needed. Tests on the Grid, by connecting two halves of the system by a single line, indicated that in Great Britain a change in frequency of 0·1 c/s corresponded to over or under-generation of 300 MW; in France the corresponding figure was 100 MW. On the information at present available the fine degree of control required could only be carried out by automatic means. The problem was, however, being further investigated by establishing a direct communication circuit between London and Paris for recording for a period the differences between the two system frequencies.

Three types of transfer had been investigated, including spill energy transfer from the h.e. plant in France, hydro and thermal exchanges for water conservation, and thermal-thermal exchanges.

DISCUSSION

MONSIEUR P. AILLERET (E.de F.) opened the discussion. From an engineering point of view the cross-Channel cable was much more important than could be judged by the cost of the project. The capital would be small compared with that invested every year in extending the power stations of the two countries, but the work involved was of a different nature and the spirit of enterprise and adventure played a much bigger part in it. So far as its economic value was concerned, estimates made over the last two years showed that there were many cases of diversity between the two countries, due not only to different times of meals and work but to the fact that they did not have their mechanical troubles or their strikes or their national festivals at the same time. The accidental nature of this diversity affected the possibility of taking technical risks, which could be accepted and their consequences judged on a probability basis, as was already the case for many international power links on the Continent.

MR P. J. SQUIRE (B.E.A.) felt that there was evidence which would justify a larger cable than was now contemplated. Since the paper was written, figures for the diversity during the past winter had become available, and showed that in spite of the cold spell which covered both England and the Continent in February the diversity had been 500 MW, whereas the Joint Committee had assumed that only 300 MW could be relied on.

MR A. RUSCK (Swedish State Power Board) referred to the d.c. transmission from the Swedish mainland to the island of Gotland. In the converter station on the mainland, a.c. from a 132 kV network was converted to d.c. at 100 kV, feeding a single-core cable with a length of 62 miles to Gotland, where the d.c. was converted to 30 kV a.c. The direct current returned by the ground and the sea, the electrodes being placed 6 to 8 miles south of the cable shore ends to avoid corrosion. The capacity was 20 MW and might be increased to 40 MW by using a second cable. Today ionic valves having a capacity of 10 MW were installed; the others would be added in the summer. On 7th March the first energy had been transmitted, limited to between 2,000 and 4,000 kW owing to the non-arrival of a synchronous condenser. Everything went smoothly, and on 20th March, with the arrival of the condenser, it had been hoped to go up to 10 MW, but on 19th March a cable fault occurred which had only just been put right. The troubles experienced had nothing to do with the converter stations, and if these worked as well in the future as they had during the first twelve days such good operation records should be obtained that d.c. should come into the picture as the preferred solution for the cross-Channel link. It was probable that d.c. transmission could compete economically with a.c., besides permitting different frequencies on the British and French networks.

DR U. LAMM (A.S.E.A.) also dealt with the Gotland scheme and said that at one time it had been contemplated that the lead sheath should be used as the return, but this had been abandoned because if the cable was covered by an insulating sheath one small hole in it would produce concentrated corrosion on the lead sheath.

MR E. L. DAVEY (W. T. Glover and Co.), speaking as a cable engineer, said he felt that if it were decided to put the cross-Channel project into action immediately it could be carried out in the summer of 1957, allowing for the manufacture. The confidence of the British cablemakers was shown by the fact that for a similar submarine project in Canada they had put forward firm proposals, which had now been accepted. One basis for their confidence was that the cables and accessories recovered from the sea trials had been subjected successfully after being raised to the standard B.E.A. type tests for newly-manufactured cables.

For the Vancouver project, the maximum depth of water corresponded to an external pressure of 285 lb/in.^{2}, and when loosely-sheathed cable was subjected to this pressure the sheath was badly creased and the dielectric distorted, but with tightly-sheathed cable no such trouble was experienced. It was therefore decided to use the latter type, and to provide a gas passage the conductor was made of the hollow duct form, and the gas pressure value raised to 300 lb/in.^{2}, so that it should always be superior to the external water pressure.

MR O. W. TITUS (Canada Wire and Cable Co.) referred to the 69-kV installation for crossing the St. Lawrence river, and said that to avoid too steep a temperature gradient the cable had been designed with a conductor temperature much lower than that allowed for cables in duct or earth. In effect it was a compression cable, of simple construction, using oval conductor. His company believed very strongly in the hollow-core gas-pressure cable to which Mr Davey had referred, and had already installed one in the city of Vancouver.

MONSIEUR R. LAROCHE (S.A.C.M., France) and MONSIEUR M. HOUPGEN (Forges et Ateliers de Constructions Electriques de Jeumont) spoke for the French cablemakers. M. Laroche said that for the 132-kV system the gas-filled pre-impregnated cable should, on the basis of the tests which they had carried out, be successful, while M. Houpgen said that the compression cable had such good electrical characteristics that it should be suitable for any voltage for the Channel crossing. The drawback that it could be manufactured only in relatively short lengths had been overcome by the use of joints of the same diameter as the cable.

SIR GORDON RADLEY (G.P.O.) said that when building a new cable ship as the Post Office was thinking of doing, it should be made capable of doing as many things as possible. Some power engineers suggested that it would facilitate the handling of their very stiff cables if the cable were brought in over the bows and taken out over the stern, which suggested building a ship like an aircraft carrier, with a clear deck and all the top hamper to one side. So far as the making of joints was concerned, the first had taken 52 hours in all, the next 36 and the last about 26, but the target should be a maximum of 12 hours.

MR P. R. DUNN (B.I.C.C.) gave some particulars of the Vancouver scheme. It involved about 80 miles of 138 kV pre-impregnated gas-filled submarine cable. The crossing was in two parts, of 15½ and 4 miles, divided by an island, and the maximum depth about 100 fathoms. The cable differed from that used for the Channel trials largely in having the hollow conductor giving the gas channel. In magnitude and in its technical problems the project was comparable with the cross-Channel link, but the Canadian engineers had decided to proceed with it. Mr Dunn hoped that on this side of the Atlantic an equally progressive approach would be shown.

MR F. W. H. SHAW (Siemens Bros.) expressed the opinion that the nearer it was possible to get to a flexible joint of uniform diameter in a submarine cable, the better were the prospects of the cable operating satisfactorily after installation.

MR F. C. WINFIELD (Merz and McLellan) said that by 1962 the French and British systems would probably each have a generating capacity of about 30,000 MW, yet they would be tied together by a 100 MVA shoe string. In those circumstances

the control system would have to be very sensitive indeed. With d.c. it would be possible to get something like 630 MW across with the four cables, and he thought that when the change was made to 275 kV it would be necessary to go to d.c. In the next ten years there would be an enormous demand for e.h.v. large power transmissions over long distances, and atomic energy would add to such a demand.

MR C. C. BARNES (B.E.A.) remarked that the handling and laying of h.v. submarine power cables was a practical issue which could not be adequately appreciated when making academic calculations with a slide-rule in a small back room. Submarine cable installations were complex projects having little in common with normal installations of land cables. Design data for two types of 132-kV submarine cables were given in the paper which involved maximum electrical stresses of 120 kV/cm. He knew of no land cables operating at such stresses.

MR J. E. CALVERLEY (E.E.C.), replying to Mr Winfield, did not agree that British rectifier manufacturers were at fault and said that it was no use designing and building large h.v. rectifiers if there was nowhere to try them out. The Swedish engineers had been fortunate in the co-operation of the Power Board. He believed that sooner or later d.c. would come into its own for the transmission of power. If the Channel at the point where it was proposed to cross it had been a little wider than 26 miles the limit of a.c. transmission at high voltage would have been reached.

MR A. L. WILLIAMS (B.I.C.C.), dealing with the repair of cables, said that the operations at sea were likely to occupy five days. Weather statistics showed that in the best months of the year, May to July, there was an even chance of getting five days when they were wanted, but in the worst months, November and December, the odds were 9 to 1 against. Allowing for the fact that the work of repair could be split up, and that the operations of finding and marking, making the first joint, and making the second, could be separated, there was a virtual certainty in June of completing the repair in a fortnight, and in December of doing so in a month.

MR W. COX (Kennedy and Donkin), described development work which had been done in the U.S.A. by the Bonneville Power Administration with a pipe-type cable in which a 10 in. steel pipe would be laid as a unit for a distance of about five miles, the maximum depth of water being about 700 ft. After laying the pipe would be filled with oil and three cores of 230 kV cable pulled into the pipe by steel rope, the cables being held in triangular formation by roller-bearing carriages to reduce the coefficient of friction and permit pulling the cable in one continuous length. The installation would be maintained at a mean oil pressure of 200 lb/in^2. The pipes would be joined together and floated out on the water as a huge coil; when the full length was obtained this would be gradually uncoiled right across to the other side of the crossing.

MR K. W. WARDROP (City and Guilds), dealing with the control and operation of the two systems when run in parallel, suggested that if a small electrical model was made of the cable and controlled between voltages from Dover and Calais a continuous record of the power which would flow, were the cable in operation, would be obtained and could be transmitted to the control rooms in the two countries, providing a check on the mathematical work.

MR P. ROBINSON (Kennedy and Donkin), suggested that by an a.c. connection more might be lost than gained. The B.E.A. had used the powerful weapon of reduced frequency to avoid cutting off consumers when the demand exceeded available plant capacity. This effect was at present 300 MW per 0·1 c/s change in frequency, and presumably would increase. That advantage would be sacrified for the gain of 100 MW. A d.c. or frequency-conversion connection would be another matter, and would solve the problem of the interconnection of two large systems by a weak link without foregoing too many of the advantages of running separately.

MR J. E. ROBINSON (Ferranti), thought that the authors had not given the true arguments which justified their preference for 132 kV. The difference of £4 millions in capital cost between 132 kV and 275 kV arose largely from the increased cost of land transmission on the French side, which suggested that the difference in the economic comparison was bound up not with the voltage of the submarine part of the scheme but with the availability of power on the French system in the region of the Channel.

MR F. J. LANE, replied to the discussion.

Supervisors and Recruitment

RECRUITMENT to the electrical industry claimed much attention in the speeches at this year's annual dinner of the Association of Supervising Electrical Engineers, which was held on Friday under the chairmanship of Mr C. T. Melling, the Association's president. First speaker to tackle the subject was Mr H. Bishop (President, I.E.E.) who was replying to the toast, "The Electrical Industry." He asked how the Institution could help in the greater effort now required to fight overseas competitors for export markets, and suggested that one of the ways was by working to improve recruitment.

It was a fact, Mr Bishop claimed, that the electrical industry was not getting its rightful share of the best men, and he thought that this was because those at present in the industry were bad publicists. Amongst the general public there was an abysmal ignorance of what electrical engineering involved. The I.E.E. was doing much to set this right. It had to be remembered that it was not just a learned body, but also a very practical body.

For long there had been much co-operation between the I.E.E. and the A.S.E.E., and the Association's views on the training of technicians had received much attention. Technicians outnumbered professional engineers in the ratio four to one and discussions now going on were of the greatest importance. The Institution believed that there should be free interchange between engineers and technicians, and it was tackling the problem with the A.S.E.E.

Mr J. Flood (National Chairman, A.S.E.E.) who supported Mr Bishop in his reply to the toast, remarked that the Association had always encouraged its members to take an active part in its activities, and suggested that the industry had greatly benefited from this. An example of the result was the Electrical Engineers' Exhibition, which was now an undoubted success. But with success came responsibility, and the Association wanted everyone to know that the exhibition company was a non-profit-making body without share capital.

He agreed that it was important to get the best men into the industry, but he stressed a difficulty. The gap in wages between operatives and supervisors was closing rapidly, and the position was being reached where engineers were beginning to ask if it was worth while taking responsibility in electrical engineering. If the accountancy profession were studied, it was found that many of its members were undoubtably occupying positions that rightly belonged to engineers, and it was up to those present at the dinner to see that they did not get away with it.

The toast to which these two speakers had been replying was proposed in brilliant style by Sir Miles Thomas (Chairman, B.O.A.C.) He had relatively little to say on electrical matters, though he did stress the importance of the part electricity plays in research, and applauded the success of the supply industry's efforts to avoid power cuts or severe frequency variations.

The toast of the guests was in the able hands of Mr C. T. Melling, who ingeniously wove into it a continuation of the evening's theme of the recruit to the industry. Mr J. Eccles (Deputy Chairman, Operations, B.E.A.) replied.

notes on wiring

by Megohm

DURING a visit to a friend's house recently, we were just settling down for the evening when the house was plunged into darkness. Naturally I was given the job of investigating the cause and applying the remedy. After removing countless brooms and similar objects from the "cupboard under the stairs" and bumping my head every time I bent down, I eventually found the controlling switchfuse and effected a repair.

Intake Positions

It appears to be the general practice when building a house to have the meter and the controlling switches, etc., in the most inaccessible position in the house, i.e. "the cupboard under the stairs." I suppose that in the architect's opinion these controls should be kept well out of sight in order not to spoil the final appearance. Normally the contractor accepts this decision and, of course, the electricity authorities are quite happy, too, for this position usually means an easy route for the incoming supply cable. Everyone is quite happy except the person concerned.

Not only in houses do we get this attitude towards positioning control switches out of sight in any convenient corner. Architects are extremely reluctant to part with room space in which the electrical engineer can arrange his switchgear in a workmanlike manner. Many people do not realise the amount of maintenance required in large buildings such as offices, hospitals and schools, and it is only fair to the maintenance electrician that his switchroom is large enough for minor repairs. I consider that in the majority of cases, the consultant, or the contractor, is called in much too late in the planning stages.

Why should the contractor be asked to wrestle with switchfuses, fuseboards, etc., to accommodate them in a restricted place? Most switchgear manufacturers are extremely willing to co-operate by preparing dimensioned drawings showing the full space requirements. In this way small items such as the space required for switch handles and fuseboard doors, which are so very often overlooked, are allowed for. I feel that in the preliminary stages space should be provided near the centre of the building for the switchroom, and that the electrical engineer be called in at this stage.

Of course, many installations are carefully planned and ample space provided for the switchgear, and I feel that architects are becoming more interested in this matter following the many improvements in switchgear designs. Most of the manufacturers can now offer cubicle type switchgear which to the architect's eye is more in keeping with his building lines and not so ugly as the single units.

"As Installed" Drawings

Equally important to the maintenance electrician are drawings showing the installation. I contend that on completion of a new installation, the contractor should provide properly made out drawings of the installation "as installed." These drawings should show the position of fuseboards, lighting and power points and clocks, etc. The circuiting should be shown by numbers within the symbols used for the points, and in certain cases conduit runs should be indicated. A "line" diagram showing the switchgear and fuseboards with the size of the boards and the mains is invaluable to the maintenance engineer.

I can visualise certain contractors disagreeing with me on this matter and putting forward the argument that the cost of running a drawing office in order to comply with this suggestion is too great. However, this argument is groundless, for just as many contractors will point out that their drawing office pays for itself over and over again in as much that such jobs as planning the circuits for installations can be done there. Much valuable time can be thus saved. The site foreman normally plans his conduit runs in advance and marks up his drawings so the information is readily available for final recording.

Almost every consultant specifies that such drawings must be provided, but cases have been known where the contractor has offered a credit in his final account rather than supply the drawings.

Wiring on Building Sites

Temporary wiring on building sites continues to cause me some anxiety. These networks of t.r.s. cables strung through the buildings and lying on floors seem to be completely unnecessary. The cables, at first, are carefully fastened well out of harm's way, but as the work progresses the fixings are gradually done away with in order that plastering, etc., can go ahead. The result is that the cables, and these inevitable wooden boards fitted with clusters of sockets and so on, are found straggling around on the floor where wheelbarrows are wheeled over them and are placed even to trip over the consultant.

I appreciate that the main building contractor, who is normally responsible for such arrangements, desires to keep his costs down, but I feel that this is a rather short-sighted attitude to adopt. Surely he must be expecting similar types of jobs where temporary wiring is required and he should therefore plan accordingly. There are many manufacturers who make robust accessories for such trying conditions. I am quite certain that very little of the cable used for temporary wiring is used a second time.

I should like to see electrical contractors make some efforts towards educating builders in the correct treatment of temporary wiring and point out the advantages of good accessories to them. I do not recall at the moment any case of a fatal accident on a building site where I was employed or had some interest. One temporary installation I do remember, however, which caused my eyebrows to rise was in South Wales. Whilst standing on the site one day with a local electrician who did temporary wiring for the builder, the general foreman came up and complained that he had very little light on one part of the building. The electrician did no more than go to the place mentioned and catching hold of the offending fitting, which was clamped to the steel scaffolding, he proceeded to move the fittings backwards and forwards. The lamp, which had been giving very little light, immediately brightened to full strength. The scaffolding was being used as an earth return.

ACCENT ON SELLING

—SALES TRAINING AND TECHNOLOGY AT E.D.A. CONFERENCE

SINCE the worst of the restrictions on electrical selling were removed, the annual Electrical Development Sales Conference has regained its proper air of purposefulness. Enthusiasm and purpose are apparent in all the papers which were prepared for the Conference which began on Tuesday of this week, and which continues until tomorrow.

In her introductory remarks, the Chairman of E.D.A., Dame Caroline Haslett, referred to the newly named conference—it is called simply the "E.D.A. Conference"—as a record, with 740 registrations against the pre-war average of 150. She mentioned that the occasion might be one of her last public occasions. Sir Henry Self, who followed, said that the expansion of electricity sales had slowed down under recent restrictions, but should now increase rapidly. They had official permission for E.D.A. to go ahead provided the needs of industrial productivity were served and an effort was made to improve the load factor, which had fallen to under 41%. The coming E.D.A. advertising campaign was a step in this direction.

The Conference got away to a good start after Sir Henry Self's opening remarks, with a paper on "The Organisation of Sales and Service to the Consumer," presented by Mr J. Gogan, Chief Commercial Officer to the S.W. Scotland E.B. He describes this as a soliloquy of one who has spent most of a lifetime in the commercial side of the industry. To justify his choice of theme, he remarks that "our future prosperity is going to depend on sagacious planning and organising, on overwhelming our competitors and political opponents, and on the special brand of hard work which only unflagging enthusiasm can engender."

Service Centres

Although Service Centres cannot be expected to pay their way in hard cash all the time, Mr. Gogan feels it is wise to adopt a policy of balancing the budget over a period of years. As to numbers, the present level in S.W. Scotland is one Service Centre for 12,000 consumers, but this is felt to be merely an indication of the need for a considerable number of new premises, particularly in the larger towns. But Service Centres cannot work effectively unless the staff are both able and willing to impart information convincingly and with friendliness. In S.W. Scotland, two activities aiding towards this have been maintained since 1948.

One of these is the organisation of "get together" refresher courses, which are reckoned to have been most successful in improving the standard of knowledge and behaviour of Service Centre assistants. The other is a continuous competition between the Service Centres themselves. Centres are judged in alternate months, and marks are awarded for a set subject window display and for such items as interior appearance, neatness and originality of displays, and the manner and deportment of the staff.

All centres receive cash accounts, and on this subject the author makes a plea for the avoidance of dis-harmonious "prison bar" pens for cashiers.

One trouble with the usual Service Centre is the enforced neglect of the industrial consumer. A suggestion is that boards should establish an Industrial Showroom in industrial areas, where special exhibitions and demonstrations can be staged at frequent intervals for selected audiences. An electrical bulletin on industrial matters issued quarterly would be a helpful link in such work.

Staff

Commercial staff, it is considered, are too seldom properly selected. After entry, newcomers should be immediately taken in hand by their immediate superiors and by means of group training classes. Later on there may be a need for specialised training which cannot readily be given from the resources of the board. It may be that E.D.A. is the appropriate body to establish some sort of school for such courses, organised with the same national outlook which characterises the Testing House.

Whenever sales staff are discussed, the question of giving encouragement by means of monetary commissions is a major topic, and one that should be considered at national level without delay. It had to be remembered that the competitors of the electricity industry are already paying sales commission on certain goods, notably cookers. Though money is not the complete answer, if the question of incentives is not tackled soon, some of the best people are going to be lost. Another way in which the enthusiasm of the Service Centre assistants should be fostered is by making it easy for them to have the latest equipment for use in their homes, either on free loan or at a nominal charge, so that they may know its merits at first hand.

Finally, in this section of his paper, Mr Gogan mentions two questions of training. The first concerns the demonstrator. There is a danger that the reaction against the demonstrator who knew how to cook and that was all, has gone too far. It sometimes seems that present day demonstrators are too academic, and too little versed in the art of selling electricity. Domestic science colleges should include in their courses some tuition in salesmanship and related subjects, and there should be some scheme whereby promising girls in Service Centres can attain "demonstrator" status without a full time college course. Such a problem might be tackled by the national training organisation which has been mentioned.

An analogous situation exists as regards district commercial engineers. Where are the new ones to come from? A wise decision, quickly made known would do much to allay the anxiety of those one step down the ladder.

The remainder of this paper looks at the twin subjects of publicity and public relations. At its end, the author surveys the future and sees in the present downward trend of domestic consumption per consumer a serious significance which must be taken as a challenge to restore public confidence and create an atmosphere favourable to selling. In this respect, he sees, a growing danger of having too many people sitting in offices shuffling papers, and too few in the field actively selling.

Commercial Considerations

Tuesday afternoon's paper was presented by Mr R. E. Gamlen, South-Eastern E.B., under the title, "Selling Electricity; Some Commercial Considerations." One of the first topics tackled by the author is the right of supply undertakings to carry on contracting activities and the retail selling of apparatus. He maintains that it is essential

that those who generate and distribute electricity should have the ability to exert some influence over the sale of goods that go to load the mains; and that consumers are entitled to require a complete service, at any rate as far as the supply of electricity and the provision, repair and maintenance of the major current carrying appliances are concerned.

Turning next to some of the statistics of the industry, it is suggested that in spite of the absence of fully reliable figures, it appears probable that the industry's merchandise turnover exceeds pre-vesting sales. Continued records are now required as a measure of progress. In this respect, an examination of the gas industry's claim to be installing the large majority of cookers in new housing estates is of interest. In one case the claim was made that 83 out of every 100 cookers going into new houses were gas operated. Yet this did not mean what it appeared to say. It was found that once cookers brought by tenants from their former residences were eliminated, half the new cookers being installed were electric.

Cost of Selling

Area boards merely buy electricity for resale; as a purely selling organisation they must pay close attention to their cost of selling. Compared with figures published for British department stores it seems that the cost of selling in Service Centres is such as to restrict the gross surplus to a comparatively low level. This is to some extent because the profit is limited by the discounts allowed, and because the fair trading policy tends to tie the board's hands at times when they could do with more freedom to dispose of stocks.

If requests for additional sales staff are treated on a basis of the additional business to be expected, then it may be taken that to pay for himself, a new salesman must increase sales by bringing in additional sales equal to seven times his salary. This might be a better way of dealing with the appointment of new staff as far as the selling side is concerned, instead of the rather impersonal consumer/staff ratio.

Sales per assistant as revealed in the 1950 Census of Distribution amounted to £2,950 for electricity against £3,800 for gas. Both figures were well above most other trades, but in the case of electricity the gross profit may in fact be less, for reasons already stated. Selling might be improved by a better "load factor"; arranging lunch hours and days off so that assistants are always present when the majority of prospective customers are.

Training

Yesterday, there was a swing in the emphasis of the conference, and the morning session was devoted to a paper on "Training Commercial Staff," which has been prepared by Dr A. G. Beverstock, Education and Training Officer, Southern E.B. Initially this study is devoted to an examination of the general functions of industrial training, but it goes on to make some important suggestions in the field of commercial training.

One of the most interesting ideas advanced is a student commercial engineering apprenticeship scheme. Student apprenticeships have been developed almost wholly in the engineering field. Many persons who have become qualified engineers join, after a little experience, the sales and commercial departments of their organisations and are then often handicapped by their lack of knowledge of commerce or business. It is possible that this traditional method can be improved upon by training in both engineering and commerce from an early age. The electricity supply industry is particularly suitable for the application of a scheme in which an attempt is made to train an individual as a commercial engineer. The nature of the work demands a close understanding between the commercial and engineering departments, and for a number of posts on the commercial side, engineering or technical knowledge is required.

A scheme set up on an experimental basis by the Southern E.B. has the immediate object of providing a thorough training leading, in the first instance, to junior and middle positions on the sales and development sides of the Commercial Department. These positions include

Method of placing m.i.c.c. floor warming cables into preformed grooves

sales and service representatives, development engineers, showroom assistants and specialised posts in agriculture and refrigeration. There is scope for promotion after this stage to branch commercial superintendent, district commercial engineer, and higher specialist and managerial posts.

The apprenticeships are being organised on a five-year basis and are fully indentured. During the first three years, the syllabus will follow the lines of that for an electrician, including wiring, workshop practice, installation, and repair of appliances. During this period the apprentice will attend day classes at a local technical college and study for either the City and Guilds Interim Electrician's Certificate or the O.N.C. in electrical engineering. For the remaining two years the syllabus of practical training will be more specialised, and the practical work will include training in sales and showroom organisation, administration and accounts, and specialist work in refrigeration and agriculture. A special block release course will be attended at one of the technical colleges in the area, leading to a certificate in commercial electrical engineering issued by the college and endorsed by the board. Holders of this certificate will be able to proceed directly to a course for H.N.C. in electrical engineering if they so wish; alternatively they will be in a position to embark on courses leading to the examinations of the Incorporated Sales Managers' Association.

The block release course mentioned will include science, refrigeration, commerce and English. The commerce subject will touch on the power industry, production and distribution, the structure of industry in general, with special reference to the board's area, and elementary law, statistical methods, business organisation and salesmanship.

The basis of staff training in the Southern E.B. has been the "Progressive Scheme for the Training of Commercial Staff." Under this arrangement, short one- or two-day courses are organised at each of the four sub-areas for showroom assistants, demonstrators, sales and service representatives, contracting and estimating staffs, development engineers, and branch commercial superintendents. The main features of the scheme are that for any one group of employees continuous and progressive training is provided. A one-day conference for a group of showroom assistants may be arranged on a particular topic, and the same group will attend at sub-area headquarters for continuation courses at intervals of four or five months. Parallel activities are arranged at head office for senior sub-area staff. Lecturers are drawn from the staff of the department at sub-area and district level. This helps senior staff to get to know junior, and it affords an opportunity for senior staff to be kept up with the problems met by those in the field.

Floor Warming

Engineering took its turn at the Conference on Wednesday afternoon, when the Chief Commercial Officer of the S.E. Scotland E.B., Mr J. W. Moule, presented a paper on "Electrical Floor Warming." He warns in the introduction that the paper has been written for commercial rather than specialist engineering staff, but this in no way detracts from its interest or importance. To some considerable extent the paper describes the Sighthill installation at Edinburgh, which was dealt with in the ELECTRICAL TIMES of 29th October, 1953.

Experiments on comfort and heating suggest that warmth should be transmitted to the human body mainly by radiation from uniformly warm surroundings, and that air movements should be minimised. The usual convection systems fall far short of these criteria. Floor heating, on the other hand, warms the occupants of a building mostly by low temperature radiant heat. Convection air currents are considerably reduced.

Designing a floor warming installation is initially a matter of calculating heat losses which will occur from the rooms concerned. At present the practice in S.E. Scotland is to calculate on a no-heating period of 7 a.m. to 7 p.m. with large buildings in which the heat capacity of the floor is sufficiently high. It is likely that the board will have second thoughts on this, and permit a mid-day boost, however. It is the author's view that some inducement should be given to encourage the development of private house "off peak" floor heating by offering an off peak tariff with a midday boost.

To prevent discomfort, the floor temperature should not exceed 73° F, and in order to provide sufficient heat with this condition in cold weather it is necessary that the whole of the floor surface is raised to this temperature. In the Panelec system, this is secured by running the heating wires in conduit and covering the conduit with wire netting before the top screed is laid. The wire netting is raised to a uniform temperature by the warm conduit and this results in a uniform transmission of the heat through the floor. The heating cables themselves consist of two cupro-nickel resistance conductors insulated by asbestos and enclosed in a lead sheath. The electrical loading is 10 watts per foot run.

Although the Panelec system has been the main method used in S.E. Scotland, Pyrotenax has been used in the South Eastern E.B. The main problem here is to keep the Pyrotenax in place while the screed is laid. This is achieved by laying a ¼ in. screed first, and using a moulding device to make trench impressions in it which, when hard, will receive the Pyrotenax heating cable. (See illustration on page 515, kindly provided by Mr P. S. Watson of the S.E.E.B.)

Costs and Selling

Floor heating is cheap to install, and on average, the Panelec system will only cost about two-thirds of the capital cost of an ordinary central heating system. Taken overall, electrical floor warming can generally compete favourably with other forms of heating, especially where buildings are in use for most of the day. To get a fair comparison, however, all costs of competitive heating systems must be taken into account. Such factors as the higher insurance cost of a boiler system, its shorter depreciation life, and operator inefficiencies must be remembered.

Floor heating is an off peak load, as already mentioned, and an interesting possible future development may be ripple control, with, say, a guarantee that interruptions in heating will not exceed four or five hours, with not less than three hours between any two interruptions. This would keep the installation cost to be met by the consumer down to a minimum.

On the selling side, there is a need for specialist heating engineering knowledge, and for sales staff to familiarise themselves with the problems of the heating engineer. The need is especially for someone who can talk to architects and engineers in their own language, and who can discuss general questions entering into the design and construction of buildings. Early approaches must be made if floor heating is to be adopted; probably before the final design of the building is reached.

After sales service is a point that needs watching, particularly as it involves the keeping of a check on thermostats, etc., to avoid unauthorised interference which can greatly increase electricity consumption. It has to be borne in mind that the initial consumption will in any case be relatively heavy, due to the drying out of the building and the heating up of the earth beneath it.

Sockets and Standards

Is Compulsion Needed to obtain Uniformity?

By T. C. GILBERT, M.I.E.E.

A RECENT television discussion between Dame Caroline Haslett and Mr J. H. M. Sykes has served to illuminate still more brightly the present uncertainty regarding socket-outlets and plugs, which appears to be drifting into even greater confusion than prevailed before the War. Mr Sykes drew a rather pitiful picture of consumers faced with differing sizes of plugs, including the non-interchangeability of those constructed ostensibly to the same standard. Dame Caroline suggested that the position was not quite as bad as he described with the advent of the new standard to B.S. 1363, but agreed that progress in its fuller adoption should be more rapid. Mr Sykes wanted the "Government" to say that after a certain period all socket-outlets in new houses must conform to the new standard, and it certainly does seem that some such drastic action must be taken if the industry really is to achieve standardisation of this important accessory.

Many would say that the real position has been worsened with the appearance of B.S. 1363, which at present shows no sign of supplanting B.S. 546, and merely provides another addition to the previously available range. Undoubtedly the industry fully expected that all responsible authorities would specify the new standard exclusively following publication in 1949, but this is far from being the case. New types and patterns of socket-outlets to BS 546 appear almost weekly in the advertisement pages of the technical papers, and manufacturers state that at least as many of the old standard are supplied as the new. The R.I.B.A. Appendix to the Bailey Report on House Interiors recommended 15-amp socket-outlets throughout, and a E.D.A. publication "Electricity in Housing," illustrating various interiors, shows five out of six socket-outlets apparently to B.S. 546, although later deprecating their use.

Last year a contributor to "The Electrical Contractor" spoke of "that abominable ring system of socket-outlets." Mr R. J. Courtenay, writing in a contemporary, said "it must not be claimed of course that B.S. 1363 will take the place of B.S. 546, or that it was intended to do so." The writer has been particularly surprised that in the recently-issued Recommended Practice for Electrical Installations in Caravans, Table 1, Admissible arrangements of socket-outlets, shows five alternatives, four of which provide for socket-outlets to B.S. 546. Paragraph 3.3. says in addition ". . . arrangement (*a*) is preferred . . ." and this refers to 5 amp B.S. 546 socket-outlets. It is difficult to visualise any arrangement in caravan installations that could not incorporate socket-outlets to B.S. 1363 exclusively with advantage and economy, and help towards standardisation.

Many say that the exclusive use of B.S. 1363 was not visualised in 1949, but there is plenty of evidence to the contrary. One authority who can be quoted is Mr James R. Beard, who was the chairman both of the Committee responsible for Post-War Building Study No. 11, Electrical Installations, which sponsored the ring circuit and the new standard socket-outlet with fused plug, and of the B.S.I. Electrical Industry Standards Committee, which was responsible for the preparation and issue of B.S. 1363. Writing in January, 1949, Mr Beard stated that the Committee never had any other objective than to recommend the preparation of a specification for a new plug and socket that would, in time, supersede all others. This contention would also seem clear from the foreword to B.S. 1363, which reads as follows (the italics are the writer's)—"The final conclusion was that a new type of 'all-purpose' 3 kW (13 A at 230 V) fused-plug and shuttered socket-outlet should be *standardised for general domestic use and similar purposes.* This specification has therefore been drawn up with this object. The following British Standards for plugs and sockets are still in force and *are available for such purposes as extensions of existing installations or where a 30 A rating is required.* B.S. 196:1930. Reversible protected two-pin plugs and sockets with earthing connections; B.S. 546:1934, Two-pole and earthing pin plugs and socket-outlets (rated at 2, 5, 15, and 30 A)." It is clear from this that the retention of B.S. 546 was in order to provide the necessary replacements for existing installations, or their extensions, not for new installations.

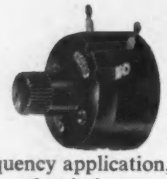
Industrial as Well

Further confusion seems to prevail regarding the approved application of the new standard, whether confined, as suggested, according to some, by the Regulations, in domestic and similar installations where a diversity factor is applicable, or whether it can be utilised indiscriminately elsewhere. Regulation 201 (C) states quite clearly that the appropriate exemptions apply equally "to other installations where the application of a diversity factor can be justified." Post-War Building Study No. 11 recommended the new standard for departmental stores (para 259), hotels (para 269), schools (para 345), and farm buildings (para 400)—in fact, everywhere except for industrial and similar installations, with which this particular document was not concerned. From this it has been argued that the new standard socket-outlet and plug is not admissible for industrial installations, but this again can be shown to be contrary to the intentions of the British Standard compilers, by quoting Mr Beard further. In the communication previously referred to, he said—"I have confirmed that the limitation to installations in private houses and residential flats in the Exemptions of this amended Regulation is related solely to the fixed wiring and to the particular diversity encountered in such premises. It would thus . . . be incorrect for any intention to limit the field of use of the new plug and socket-outlet to be inferred from the wording of this amended Regulation. As far as I am aware, it is the general intention that plugs and socket-outlets to the new standard should be adopted for industrial installations wherever their use would be convenient, and there is nothing in their design which would render them unsuitable for such use."

From all this evidence there can surely be no other conclusion than that the new standard plug and socket-outlet *was* intended to supersede all others.

Something much more drastic is necessary if the present, and increasing, confusion is to be overcome, and Dame Caroline Haslett's contention that the position is improving, justified. Every recommendation and installation of a B.S. 546 socket-outlet is delaying the day when complete standardisation will be achieved, and which has been talked about long enough; the present chaos is a standing reproach to the industry.

Radio Components on show to the Industry



11TH R.E.C.M.F. EXHIBITION AT GROSVENOR HOUSE

THE Annual Show at Grosvenor House, sponsored by the Radio and Electronic Component Manufacturers' Association, and opening today, reflects the increasing demand for electronic equipment from all branches of industry and in all countries. The range of radio components runs into such large numbers that it is only possible to deal here with a few items.

Valves

Valves and cathode ray tubes of course remain the heart of electronics, despite the development of the transistor and the magnetic amplifier. New valves, specially designed for AM/FM work on the v.h.f. broadcast band, are being shown for the first time by Mullard Ltd., and latest additions to this company's "World Series" television valves are some designed for the v.h.f. end of Band III television receivers. A new television tube, also by Mullard, has a rectangular screen with a 21 in. diagonal.

Several new valves are also being introduced by G.E.C., also for Band III receivers. Included in the Ferranti exhibits are a number of valves for industrial and domestic use, including stroboscopic lamps, trigger tubes, miniature stabilisers, thyratrons, high voltage vacuum and mercury vapour rectifiers, spectral light sources and so forth. The English Electric Co. are also displaying some valves, mainly for transmitting purposes.

Transformers and Capacitors

Several additions to the wide range of Gecalloy powder-magnet radio and television cores are being exhibited by Salford Electrical Instruments and the display also features new Gecalloy materials for use in tuning circuits operating at frequencies in the range 100-1,000 Mc/s. From Standard Telephones and Cables come the range of Permalloy cores mainly representative of the toroidal design; while Mullard are showing examples of the use of Ferroxcube in high-efficiency deflection coils.

The Ferranti "Pentland" series of components includes power transformers and chokes, signal and pulse transformers and delay networks. These units are cast in a solid block of synthetic resin. The "HiQor" range of powder cores, produced by the Telephone Manufacturing Co., are shown in a comprehensive range of sizes with permeabilities adequate for all requirements. Plessey have a large number of iron dust cores on show, while English Electric are manufacturing a range of transformers with "C" cores.

Improved characteristics with reduced size for electrolytic condensers are significant features. It is, in fact, estimated that in the past year the reduction in size for a given capacitance and voltage is of the order of 10%. Dubilier have an entirely new range of "High K" ceramic dielectric varnish-protected tubular capacitors for general radio frequency application, and a new type of fully sealed, metal-encased tubular ceramic capacitor operates at frequencies even in excess of 150 Mc/s. The "Duconol" electrolytic series is built by a newly-developed process which has enabled substantial reductions in weight and dimensions to be made together with an increase in working temperature.

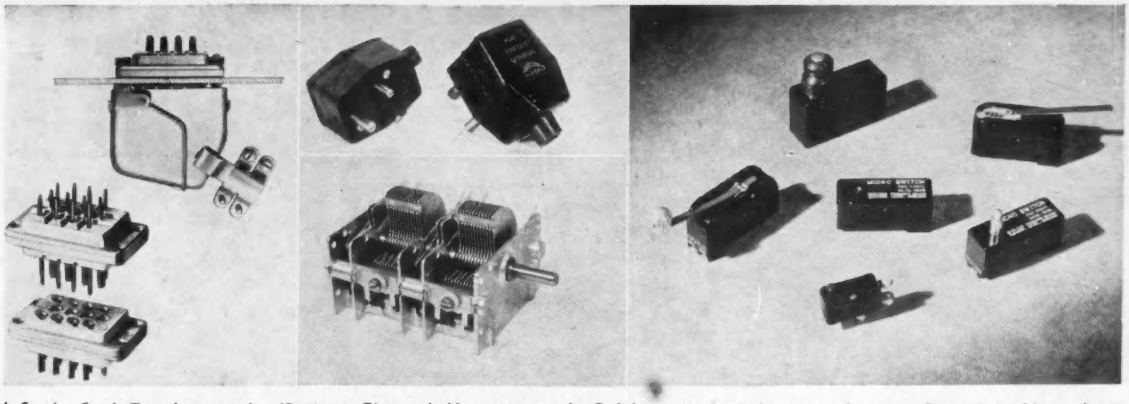
Electrolytics using tantalum electrodes are a speciality of Standard Telephones and Cables. Owing to the inert nature of this metal it is claimed that such capacitors do not deteriorate during their shelf life. The capacitance values lie in the range of 0·3 microfarad to 200 microfarads. Telegraph Condenser Co. are introducing the new low-leakage high-quality condensers, of prime interest to the designers of low frequency amplifiers for grid-coupling where their outstanding electrical characteristics can be put to best advantage. It is claimed that for the first time it is possible to think in terms of insulation resistance with electrolytics and that the figures of I.R. are comparable with the standard paper dielectric condensers. Also on display is a new sub-miniature electrolytic condenser of even smaller dimensions than those first shown at the 1953 show. This component is only $\frac{1}{2}$ in. long by $\frac{1}{8}$ in. diameter and has been designed for use in transistor amplifiers. It has a capacity of 2 microfarads (8 V d.c. working) and has synthetic resin end-seals. Latest T.C.C. additions to the Hi-K ceramic group are the miniature lead through condensers which are of especial interest to designers of TV receivers for Bands 3 and 4. They have a capacity of 1,000 pF and are intended for soldering on to a chassis or sub-assembly. A new range of metallised polystyrene condensers is also available in tubes or metal cans. The Telephone Manufacturing Co. have a display of capacitors covering the complete equipment requirements of a portable radar station.

A. H. Hunt (Capacitors) Ltd., have miniature metallised paper types for operation from −100° C. to +120° C., and new developments in mica construction are miniature stacked foil and silvered types.

Resistors

Among new products shown by Egen Electric Ltd. are two pre-set potentiometers; a carbon rotary control and a similar type embodying a wire-wound element. The design of these items is based on the Company's long experience of the requirements of television and electronic equipment manufacturers, and new additions have been made to the range of Egen sub-miniature carbon pre-set potentiometers including types suitable for equipment which is likely to be subjected to extreme vibration; such as guided missiles and special test equipment. The locking is achieved by a

At top of page—left to right—are Egen's new pre-set potentiometer; Ferranti's T.R. cell and Berco's heavy duty potentiometer



Left, the Cinch Type J plug socket (Benjamin Electric Ltd.), centre top, the Dubilier suppressor plug, centre bottom, a Plessey variable condenser for AM/FM working, and right, a selection of Burgess micro-switches moulded in Bakelite

screw which expands a split collett in the centre of the rotor, and thus locking is independent of the setting adjustment and the need for using two tools simultaneously is avoided.

Plessey have a range of wire-wound potentiometers including an inexpensive 3 watt loading design for TV applications. There is also a 1 watt wire-wound potentiometer, panel and spindle sealed, designed to withstand severe conditions of bumping, vibration and climatic exposure over a temperature range of −40° C. to +100° C. Both solid carbon composition and wire-wound resistors are shown in the Erie Resistor Ltd. exhibit, who have also a selection of their ignition interference suppressors on view. In the potentiometer field is a new concentric spindle double control unit, which can be supplied with or without switch to meet manufacturers' requirements for a concentric control with dissimilar spindle diameters for the operation of the respective elements.

Three new components are being introduced by the British Electric Resistance Co. this year. One, the Berco Rotary Regavolt continuously variable transformer is the smallest of its type available in this country and can be built into electronic equipment. Two sizes are available, 0·8 and 2 amps. The toroidal winding is swept by a brush rotated by a knob. The second item is a range of five sizes of toroidal-wound power-type rheostats of 25-100 watts rating with all porcelain construction with the windings embedded in vitreous enamel. Silver graphite is used as a brush contact medium, and a large number of accessories are available to provide ganged assemblies. Last, there is a new range of three plastic moulded collett fitting knobs which can be supplied in black or other colours.

Miscellaneous Items

The Carr Fastener Co., who are represented in this country by Benjamin Electric Ltd., have a large array of valveholders, plugs, terminal blocks and strips, valve retainers, plugs and sockets, etc. Valve retainers also fill an important section of the stand of Electrothermal Engineering Ltd. A special item being shown by this company is the "Precistor," a high stability wire-wound resistor with a stability of 0·1%.

As is usual, Bulgin are showing an enormous range of items, including switches, micro sensitive switches, thermal cut-outs, connectors, plugs, sockets, lampholders, signal lamps, test prods, terminals and numerous other items.

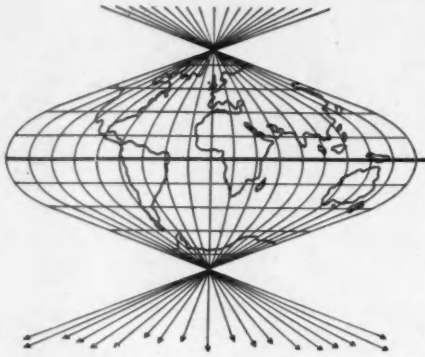
An outstanding item is the Plessey fully automatic multi-speed record changer which will operate from any a.c. mains supply. Working at any one of the three speeds, the changer will take and play any make of commercial gramophone record, and will provide up to 4½ hours continuous entertainment. Ten-inch and twelve-inch records can be mixed in the one stack for automatic playing without pre-setting for each record. Another item on this stand is the multichannel television tuner for frequency bands I and III. This is of the turret type and can be used to select any number of channels, up to a maximum of twelve, within the two bands, thus covering the international television channels for export requirements and also the proposed home commercial TV range.

Steatite and Porcelain Products are showing a new stable high-permittivity ceramic (K=3,200) called Faradex H, and another new steatite-type material Frequentite S, of extremely low dielectric loss. Semi-conductors are more prominent this year, Mullard, for example, have junction triodes, and germanium diodes, while G.E.C. are showing applications of the germanium diode.

The problem of suppression of interference to television programmes by portable electric tools, has been largely solved by the Dubilier bushing suppressor, type SBC7, which is a miniature unit only ¼ in. dia. and 1½ in. long. Line currents up to 15 amperes can be carried by the centre conducting wire, and it may be incorporated inside many portable tools. The same company have also produced a radio interference suppressor plug comprising a standard 5 amp or 15 amp 3-pin plug with the suppressor capacitors included in the body of the plug.

New ideas in solder and soldering are featured on the Multicore Solder stand, whose main exhibit is of course devoted to the well-known Ersin Multicore solder with its three cores of non-corrosive flux. A new type of solder contains a special Pentacol derivative non-corrosive flux which is particularly efficacious for high speed soldering. This product is at the moment only available to manufacturers at home and overseas.

Cables and special magnetic materials are featured by the Telegraph Construction and Maintenance Co., who have added a duplicate series of 50-ohm coaxials to the range of Telcon helical membrane coaxial cables. Further work has been carried out on the design and development of screened quad cables for television relay systems. An unusual cable development is being shown by Reliance Electrical Wire Co. who have a noise free cable which reduces to a minimum spurious signals arising from mechanical movement. British Insulated Callenders Cables are showing various plastic insulated wires and cables, multiway cables, and winding wires, including "Bicalex" and "Bicaloc" covered, "Fifty-three" enamelled, and glass-covered types.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Additional Power

The first 105,000 h.p. generator at the Waneta hydro-electric power plant of the Consolidated Mining and Smelting Co. of Canada Ltd., was put into operation a few days ago. The second turbine and generator, to complete the first stage of the project, is expected to be ready for operation later this year. The station is situated near Trail, British Columbia, the dam being located on the Pend d'Oreille River near its junction with the Columbia River, just north of the U.S. border. The station will supply additional power to the company's metallurgical and chemical fertiliser plant at Trail. Present plans provide for the installation of two more generating units of the same capacity of those in the first stage.

Winnipeg Studying the Offer

After a lengthy, and at times heated, discussion Winnipeg City Council last month agreed to seek the services of a firm of consulting accountants to aid the city's special power committee in its study of the Provincial Government's power distribution proposal. As we have already reported, the Manitoba Government has suggested that all the former distribution properties of the Winnipeg Electric Co. within the city's boundary, and now owned by the Government, should be taken over by the City Council, while at the same time the latter's distribution properties outside the city boundary should pass to the Manitoba Power Commission.

A Suggestion in B.C.

There are suggestions from responsible quarters that Premier Bennett of British Columbia may not make any immediate appointments to the B.C. Power Commission, or to the post of chief engineer, following the resignation of those officials (noted in 25 Mar. issue) as the result of the inquiry judge holding them negligent in regard to the Whatshan power plant landslide. It is now being suggested that there might be an arrangement between the British Columbia Electric Co. and the provincial Power Commission, whereby the company would assume transmission and distribution rights, with the Commission responsible for power generation and development. But as yet there are no definite indications of such a step being proposed.

Improving the Standard of Living

In Ontario there is an electric washing machine for every 4·58 residents, a radio for every 3·9 residents, an electric range for every seven residents, an oil burner for every 14 residents and a refrigerator, including gas and kerosene models, for every 4·7 residents. This information was given by Mr R. H. Saunders, chairman of the Hydro Electric Power Commission of Ontario a few days ago when reporting to the Legislature's Committee on Commissions. He was underlining his contention that the standard of living in Ontario had climbed steadily.

U.S.A.

New Atomic Power Project

Development of the boiling water atomic reactor which may substantially reduce the cost of atomic generated electric power, has been referred to by Dr L. R. Hafstad, of the U.S. Atomic Energy Commission. He predicted that before 1959 reactors would be built that should be able to compete with power from coal and oil. The new boiling water reactor, he said, differed in two significant respects from the pressurised water reactor built for the atomic submarine *Nautilus*. In the experimental boiling water reactor, which will have an output of 5,000 kW, water will be converted into steam directly without the use of an intermediate heat exchange system, he explained. The new reactor with its power plant is one of several projects of the reactor programme recently announced by the Atomic Energy Commission for the peace-time development of atomic energy to produce industrial power.

WEST INDIES

Funds for Trinidad

Of the $28 million to be raised by the Trinidad and Tobago Government this year from Loan Funds, $6 million is allocated to the Trinidad and Tobago Electricity Commission. In addition, the Electricity Commission have found it necessary to further revise their estimates in the light of consumer demand and to make provision for electricity extension to cover the period ending 1957. Revised estimates have shown that a further sum of approximately $10 million will be required to meet the cost of this extended programme, and the Government proposes in the near future to introduce legislation to authorise a loan to be raised for electricity undertakings.

Total amount to be spent on electricity developments for the period 1949-57 is $20 million made up as follows: $4 million raised under the Loans Ordinance 41 of 1946; $6 million included in the Five Year Economic Programme; and $10 million to be authorised by the Bill to be introduced shortly.

SCANDINAVIA

Power Export Discussed

At a recent meeting in Stockholm between delegations from the Swedish and Norwegian Governments, a number of questions jointly affecting the two countries were discussed. Among these was the proposal that Sweden should import power from Norway. In particular, the latest scheme under which Trondheim would send power to Stockholm was discussed at some length, it seems, although no decision was reached. (The Swedish Government has already sanctioned the scheme.) In this plan which has evolved from negotiations between the Trondheim and Stockholm Municipalities, the former would construct a new hydro-electric station on the Nea River in order to supply in bulk to Stockholm who would provide financial assistance for the project. The two municipalities have, in fact, come to an agreement on the matter but this has not yet been sanctioned by the Norwegian Government, for in that country, there is still strong criticism in some quarters who maintain that it would be wrong to export hydro electric power although the country has such vast undeveloped potentialities.

TURKEY

Power Plan

To supply electricity to the Rizi-Ordu district in north eastern Turkey, it is proposed to erect a hydro-electric power station at Ikizdere, on the Kizildere River, about 15km south of Rize, as we earlier reported. It is now proposed that the station shall have a capacity of 15,540 kW, according to the Turkish Ministry of Public Works, who estimate the cost at £T11 million, plus a further

£T3 million for the necessary power lines. The project has been placed in the hands of the Iller Bank who will probably be inviting tenders very shortly.

S.W. ASIA

H.E. Power for Pakistan

The Dargai hydro-electric station, in Pakistan, which was put into operation recently, has one machine running, and power is being given to the Swat State, Malakand and other villages in the Malakand tribal area. The second generator is expected to be operating any time now. The Dargai hydro-electric scheme has been built as a replica of the Malakand power plant five miles down stream in the upper Swat canal. The tall race of the Malakand has been taken along a falling contour in the adjoining hill side at the end of which there is a drop of 250 ft back into the upper Swat canal through a power house with four 5,000 kW turbo-generators. The station supplies power to the Punjab and is interlinked with the Rasul Project at Jhelum. The 132 kV line between Dargai and Wah is also complete.

Railway Electrification

We have already referred to the preparation of schemes for electrification of about 500 miles of railways around Calcutta. The matter was further raised in a debate in the Council of State recently, when the Minister for Railways and Transport explained that the Government would have to consider the question of electrification in the context of the availability of power with the execution of the river valley projects. The Minister stated that while electrification required heavy initial expenditure, the railways would have to plan ahead and examine various schemes to be put through on a programmed basis. For example, electrification could be undertaken of several sections on the Southern Railway, and electrified sections on the Western and Central Railways could be extended. They could also consider electrification of the Amritsar-Delhi route on the Northern Railway and the Kanpur-Lucknow section of the Eastern Railway. It was intended to electrify more than one section as early as possible.

Heavy Plant Production

To discuss the proposals for the establishment of a heavy electrical equipment factory in India, a team of experts of the German electrical firm, Siemens, arrived in New Delhi last month. The project report, which Siemens recently submitted to the Government, states that a factory of the kind proposed can be established with advantage in India. A project report is shortly expected from Associated Electrical Industries Ltd., and a decision regarding the foreign firm which should be associated with the project will be made after making a comparative study of both the reports. It is proposed that the terms of the agreement between the Government and the foreign firm, which will finally participate technically and financially in the establishment of the factory, will be more or less on the same lines as those of the recent steel plant project.

AUSTRALIA

Tariffs in Tasmania

Any reductions in tariffs by the Hydro-Electric Commission of Tasmania would involve a loss which would eventually have to be carried by the taxpayer, the State Premier, Mr Cosgrove, announced recently at the annual A.L.P. Conference. He was speaking in opposition to a motion calling on the Commission to reduce its charges. Mr Cosgrove said increases in electricity charges in Tasmania since the war had been less than wage increases or rises in the price of other commodities and services. In Melbourne charges were 47% higher, Adelaide and Brisbane charges were 63% and 73% higher respectively, and Sydney rates were more than double the Tasmanian figure. In Tasmania, because of Government subsidies, the same electricity rate applied to town and country consumers. Hydro-electric works in Tasmania involved an investment of about £50 million and the annual gross income of £3 million was only 6% of the capital invested. No other business operated on such a low return, he declared. The motion, which asked the Commission to reduce a recent increase of 30% in charges to 10% was defeated by a vote of 46-77. The Conference carried another resolution calling on the Commission to install refrigeration and hot water systems in private homes on a hire-purchase basis.

NEW ZEALAND

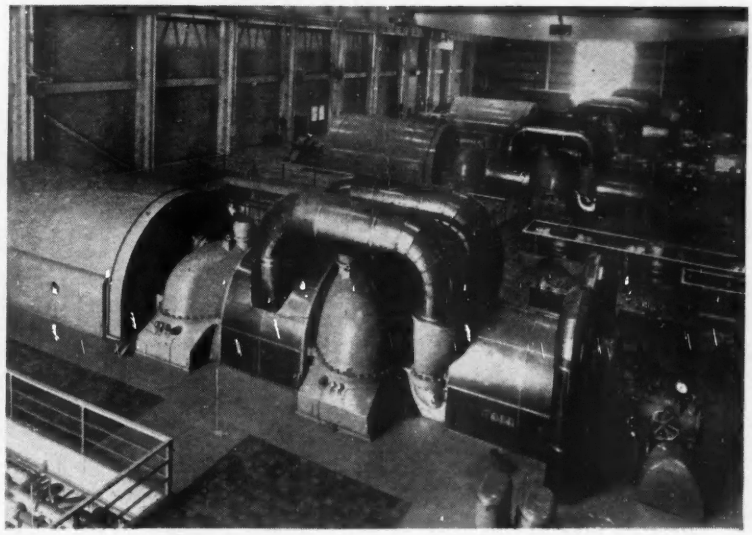
Main Substation Ready

The first half of the new Islington substation of the N.Z. State Hydro-Electric Department was put into operation recently when the power line between Timaru and Islington was made live. The 220 kV cable from Timaru is now on half load. Eventually the Islington substation will have a capacity of over 300,000 kW. At present only one bank of transformers operating at 40 kV is working. Equipment within the substation includes air blast circuit-breakers and transformers manufactured in Switzerland. The substation will eventually handle power from the Roxburgh hydro-electric project.

BORNEO

Plan for Brunei

A scheme to provide electricity throughout the State of Brunei is under consideration by the Borneo Government, we learn. The cost of the scheme has been estimated at twenty million Straits dollars. The scheme, which has been submitted by Preece, Cardew and Rider, the consulting engineers, through the Crown Agents for the Colonies, provides for the construction of a steam power station on the Belait River, utilising waste from the Seria oilfield.



An explosion occurred last Thursday at Canada's largest steam generating station, the Richard L. Hearn station at Toronto, of the Hydro Electric Power Commission, pictured alongside. Damage estimated at over $1 million was caused by the explosion as a result, we understand, of a leak in the hydrogen line in the turbine room. One of the four generators was severely damaged, and although the whole of the plant was temporarily put out of action, no one was injured. Two sets were running again by the week-end, but a further explosion occurred on Monday last, we understand. The fourth C. A. Parsons hydrogen-cooled generator was put into operation at the station only a few weeks ago. The station was originally brought into service in October 1951 (see Electrical Times, *8 Nov., 1951), and will have an installed capacity of 400 MW when all four units are operating at 60 c/s. At present 3 sets have been operating at 60 c/s and one at 25 c/s. The machine operating at 25 c/s runs at 1,500 r.p.m., and has an output of about 80MW at 11 kV. After rotor alteration, it will run at 1,800 r.p.m., 60 c/s, with 100 MW output at 13,800 V. In charge of the Toronto power station is Mr G. R. B. Morgan, A.M.I.E.E., formerly with the South Eastern Division*

Personalities IN THE INDUSTRY

We learn from Igranic Electric Co., Ltd., that **Mr S. P. Maynard,** B.SC., A.M.I.E.E., has been appointed director and chief engineer of that company. Mr Maynard has been with the concern since 1929 when he joined the Engineering Department. In 1935 he was appointed chief designer, development manager in 1953 and chief engineer in January of this year. Prior to joining the Igranic Electric Co., Ltd., in 1929, he served a graduate apprenticeship with Mather and Platt Ltd., and subsequently served in the Electrical Distribution Department of the Southern Railway and with I.C.I. Ltd., of Billingham, as electrical engineer.

Mr F. L. M. Forsey has been appointed a director of Engineering and Lighting Equipment Co., Ltd. **Mr S. A. Marples** has retired from the board of that company.

Senior director of Mather and Platt Ltd., **Mr Herbert Taylor,** M.I.E.E., retired last week after 64 years with that firm. He was for over 30 years director in charge of the electrical department, and had travelled widely for the concern.

The Industrial Association of Wales and Monmouthshire announces that **Mr F. A. Austin,** works manager Hoover (Washing Machines) Ltd., has been elected to the Council, **Dr H. Mastin,** M.SC., manager, British Aluminium Co., Ltd., Newport, Mon., has been elected to the South Wales Executive Committee, and **Mr D. H. Graham,** of International Refrigerator Co., Ltd., to the North Wales Executive Committee.

Mr K. C. J. Hutton has been appointed to the board of the Sterling Cable Co., Ltd. He has been associated with that concern since the end of 1945, being particularly well known on the export side of the business, and has been responsible for launching several new types of cable in the markets of the world. He will continue to concentrate on the company's export business.

The following promotions are announced at Hoover (Electric Motors) Ltd., Cambuslang: **Mr E. W. Bennett** from chief production engineer to production manager, and **Mr J. P. King** from assistant superintendent, P.E.D., to superintendent, P.E.D.

Mr A. D. Holmes has been appointed manager of the Electrical Department of Heal and Son Ltd., following the death of Mr F. C. Phillips (noted on page 523). Mr Holmes was with Heal's from 1925 to 1933 during which time he went through various departments. There followed a spell with Gordon Russell, of Broadway, and after the war he returned to Heal's, and has been a salesman/buyer for Heal's Contracts Co.

Mr John V. Daniel and **Mr Eric T. R. Ball** have been appointed directors of the British Electric Transformer Co., Ltd.

The newly formed North West, Merseyside and North Wales Generating Division of the B.E.A. is to be administered by a Committee of Management consisting of the controller, **Mr A. R. Cooper,** M.I.E.E., M.INST.F., the deputy controller, **Mr P. Briggs,** M.INST.F., and, initially, two part-time members. To the latter posts, **Mr F. W. Lawton,** M.I.MECH.E., M.I.E.E. (who recently retired from the position of Divisional Controller of the Midlands Division) and **Mr W. S. Burge,** M.I.E.E. (formerly Divisional Controller of the East Midlands Division) have been appointed.

Mr I. M. O. Hutchison, sales director of the Balfour Group of engineering companies, has just arrived in New York on the first stop of the four months' round-the-world air tours which takes him to America, Canada, New Zealand, Australia, Tasmania and South Africa.

At present transmission design engineer to the B.E.A., **Mr F. J. Lane,** O.B.E., M.SC., M.I.E.E., has been appointed deputy chief engineer (transmission) to the Authority in succession to **Mr D. P. Sayers.** Prior to taking up his present position, Mr Lane was with the Central Electricity Board for 17 years.

Siemens Electric Lamps and Supplies Ltd. announce that **Mr T. D. Charles,** M.B.E., who has been their acting manager in Glasgow, has been confirmed in that appointment.

Sunvic Controls Ltd. have appointed **Mr Frank N. Yates** as their north western representative following the resignation of **Mr H. Benton.**

Having reached the normal retiring age, **Mr G. M. Wright,** C.B.E., B.ENG., M.I.E.E., has this month relinquished his position as engineer-in-chief of Marconi's Wireless Telegraph Co., Ltd., but he remains with the company as full-time general technical consultant. As a result the following appointments have been made: **Mr B. N. MacLarty,** O.B.E., M.I.E.E., takes over the position of engineer-in-chief; his deputy is **Mr R. J. Kemp,** the present chief of research, and **Dr E. Eastwood,** PH.D., M.SC., M.I.E.E., deputy chief of research, replaces Mr Kemp as chief at the company's research establishment at Great Baddow. The retiring engineer-in-chief, Mr G. M. Wright, joined the company in 1912. During the first world war, while holding a temporary commission in the R.N.V.R., he was closely associated with the famous Naval D.F. network and other special duties. In 1919 he returned to the Research Department of which he was appointed deputy chief in 1928, and later, chief. His work as a research engineer gained for him an international reputation, particularly in

Mr K. C. J. Hutton

Mr G. M. Wright

Mr B. N. MacLarty

Mr R. J. Kemp

Dr E. Eastwood

the fields of D.F. and facsimile telegraphy. During the second world war he was seconded to the Admiralty, becoming chief scientist at the Admiralty Research Establishment. He returned to the company as engineer-in-chief in 1946. In 1948 he was appointed a member of the Radio Research Board of the D.S.I.R. Mr B. N. MacLarty joined the Development Establishment of the Aeronautical Department at Writtle in 1921. While there he constructed the famous Marconi experimental broadcast transmitter "2MT." After twenty-one years with the B.B.C., he returned to the Marconi Co. in May 1947 as deputy engineer-in-chief. Mr R. J. Kemp joined the Company in 1917. From 1930 to 1939 he was engineer-in-charge of television research. During the war he was responsible for Air Ministry Special Research at the Great Baddow Research Establishment of which he became assistant chief in 1946. He was appointed chief of research in 1948. Dr E. Eastwood is a physicist who has been engaged primarily in research in the field of molecular constitution and in the application of radar techniques to the investigation of celestial noise and the detection of meteors.

Mr Hugh S. Allpress, A.M.I.E.E., F.I.E.S., is shortly leaving for a tour of duty as special representative in Iraq for the General Electric Co., Ltd., in collaboration with its agents, Iraq Mercantile Ltd. He will be in Baghdad during the British Trade Fair which will be held there from 25 Oct. to 8 Nov.

For the past seven years chief superintendent of the Signals Research and Development Establishment of the M.O.S., **Dr G. W. Sutton,** B.SC., PH.D.(ENG.), M.I.E.E., has taken up a new post as director of research and education for the Siemens Brothers group of companies. He was with Siemens Brothers from 1930 until 1942 (latterly in charge of their General Telephone Laboratory) when he was loaned by the company to the Ministry of Aircraft Production.

Mr W. J. H. Wood, M.I.E.E., M.I.MECH.E., retired as a part-time member of the London Electricity Board on 31 Dec. last and to mark the close of a long and distinguished career in the Electricity Supply Industry some 100 former colleagues of the County of London group of companies recently met to bid farewell to Mr Wood. Among those who paid tribute to Mr Wood were Sir Robert Renwick, BT., K.B.E., Sir John Dalton, Messrs W. M. Booker, N. F. Gadsdon, C. L. Jaques and H. C. Wells.

Mr H. S. Allpress

Mr J. G. Christopher

Dr G. W. Sutton

Assistant sales manager, Osram Lamp Department of the General Electric Co., Ltd. for the past seven years, **Mr John G. Christopher,** T.D., F.I.E.S., has been appointed general sales manager of the Atlas Lighting Division of Thorn Electrical Industries Ltd. He started his career with the G.E.C., and was trained as an illuminating engineer. In 1931 he was loaned by the company to the London Underground Railways for 2½ years and undertook responsibility for the lighting of the Cockfosters extension and rebuilt stations in the Central London area.

In our note last week of the additional sales appointment announced by the English Electric Co., Ltd., we should have made it clear that these related to their Domestic Appliance sales force.

Mr N. C. Robertson, C.M.G., M.B.E., deputy managing director of E. K. Cole Ltd., has been formally elected a director of Ekco Electronics Ltd. It is also announced that **Mr R. Wrathall,** for many years sales manager of Philips Electrical Ltd., has joined E. K. Cole Ltd. as radio sales manager. Ekco have also nominated **Mr R. A. Drummond,** formerly northern area manager, as assistant sales manager, North, and **Mr R. S. Underwood,** previously southern area manager, as assistant sales manager, south.

The Minister of Fuel and Power has re-appointed **Mr J. T. Graham,** A.R.T.C., M.I.MECH.E., **Alderman A. Sturgess,** O.B.E., J.P., and **Mr G. H. B. Wilson,** C.B.E., M.C., A.F.C., J.P., as part-time members of the East Midlands Electricity Board. **Alderman A. Joyce,** C.B.E., J.P., and **Alderman J. Minto,** J.P., have retired from that Board on completion of their terms of office. The Minister has appointed **Councillor H. T. Fullwood** as a part-time member of the Midlands Electricity Board, and re-appointed **Mr C. R. Heathcock,** F.C.I.S., and **Mr J. McDowall** as part-time members of that Board. Re-appointed as part-time members of the Yorkshire Electricity Board are **Alderman R. Barber,** J.P., **Alderman J. H. Bingham,** LL.D., J.P., and **Mr R. E. Crowe.** The Minister has also appointed **Mr J. Bowman,** C.B.E., J.P., as a part-time member of the North Eastern Electricity Board.

Mr C. J. Blackett, Bristol district engineer, South Western Electricity Board, has been appointed district commercial manager for Bristol South, for the Board, and will take up his new duties later this month. He succeeds **Mr H. F. Lidster,** who is joining the North Western Electricity Board at Blackpool.

L. to r. Sir Robert Renwick, Mr W. J. H. Wood, Mr L. E. W. Humphries, Mr H. C. Wells and Mr F. C. Fenton at the farewell to Mr Wood

OBITUARY

Mr G. G. Burford, M.I.E.E., M.AMER.I.E.E., deputy chief engineer to the Merseyside and North Wales Electricity Board, died recently, aged 55. At vesting day he was assistant to the chief engineer of the British Power and Light Corporation Ltd.

Mr F. C. Phillips, manager of the electrical department of Heal and Son Ltd., since 1939, died on 8 Mar., aged 59.

Mr Robert F. Bruce, a director of the Saxonia Electrical Wire Co., Ltd., died on 23 Mar., aged 60. He had been connected with the cable industry for 30 years.

Mr. C. A. Clench, M.I.MECH.E., M.INST.F., chief generation engineer (construction) with the London Division, B.E.A., for the past three years, died on 3 Apr., aged 54. He had been largely responsible for the Division's construction programme for the new Bankside and Deptford East stations and the extensions at Woolwich.

Mr H. J. Chaytor, formerly district engineer of the Liverpool Contracts Office of British Insulated Callenders' Cables Ltd., died recently, aged 74.

Mr. A. Kirk, A.M.I.E.E., formerly engineer with Northcliffe Newspaper Group Ltd., died on 1 Apr., aged 83.

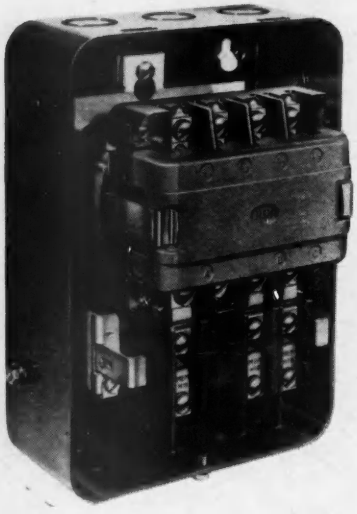
Equipment for Industry

M.E.M. has a new "Autoline" Range

AMONG the motor control gear on show at the recent A.S.E.E. Exhibition, the new "Autoline" starter seen on the stand of the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Tyseley, Birmingham 11, aroused such interest that for readers who were not able to visit the exhibition we are giving a brief description of it. Introduced to the market at the exhibition, this starter is primarily designed for use with machine tools and similar equipment, being available in a range of standard ratings from 1½ to 15 h.p. at four voltage ranges of 200/250, 340/380, 380/440 and 440/500. A feature of its design is seen in the new pattern of thermal overload relay, which employs a heating element available in 27 sizes, from 2 to 25 amps motor current, whilst resetting may be changed from automatic to manual operation.

In the contactor starter unit itself, design of the magnet system is aimed at ensuring accurate alignment and freedom from noise. High grade magnet steel is used for the system, the lower magnet being self-aligning whilst the moving part runs on ball bearings. Double break switching is employed using solid silver contacts of ample size. Maintenance of the unit is assisted by the simple method of removing contacts for cleaning.

The compact assembly of the "Autoline" starter is well shown here

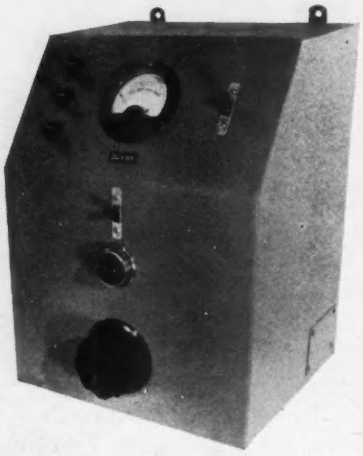


Each thermal relay in the starter comprises a toggle action q.m.q.b. switch actuated by a bimetal strip. The latter is energised by a heating element (of either strip or spirally wound wire type) mounted below it and quickly removable in case of failure or replacement by one of different rating. Normally, heaters are supplied to give protection at 25% overload, but the range of heaters available enables this to be varied as required.

Associated with the starter is the M.E.M. "Autoline" fused isolator, similarly introduced at the Exhibition. Available for either flush or surface mounting, this switch is of the rotary type, rated at 15 amps, 500 V a.c. and like its companion, is primarily designed for use with machine tools.

Variable Speed f.h.p. Motor

ATTEMPTS at achieving infinitely variable speeds on a motor less than 1 h.p. in size can prove to be either inefficient or too bulky for the size of motor involved. In answer to the general problem of arranging a motor drive to run at a predetermined speed, irrespective of load, within the operating range, both hydraulic and Ward-Leonard drives are suitable but cost alone precludes their use in the f.h.p. range. For this purpose, the OLIVEX CO., LTD., 102 Albany St, N.W.1, are now introducing an electric unit, which with the specially wound motor used in conjunction with it gives speed variation from 70 to 2,800 r.p.m. with constant torque throughout the range.

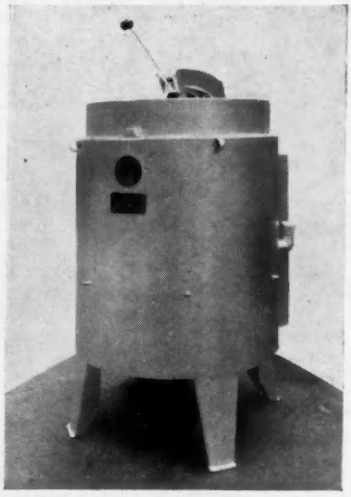


Control unit for the "Olivex" infinitely variable speed motor drive

Details of the method of control are as yet not available but the control unit itself is of a size which permits its being fitted to a wall or machine. Operating from a standard single phase a.c. supply, control equipment is completely static, speed variation being effected by the knob on the front of the box. A meter in the unit may be calibrated in r.p.m. but as such drives have particular applications for controlling conveyor belts, a calibration to suit customers' requirements can be provided. At present, one rating of drive motor is available, of maximum output of ½ h.p.

Furnaces for Steam Tempering

TO meet a growing demand for a standard steam atmosphere furnace for oxidising drills, electrical parts and other components requiring a rust-resisting finish, BIRLEC LTD., Tyburn Rd, Erdington, Birmingham 24, have recently introduced a range of such equipment, developed from their familiar VFC unit. It is a vertical cylindrical type built on orthodox lines, making use of the well-known principle that steel components heated in a steam atmosphere acquire an adherent skin of ferrospheric oxide which is both electrically non-conducting and rust-resisting. This treatment is particularly suitable for electrical steels to be used as laminations, whilst its application to steel drills enables their final heat treatment to be undertaken without a final grinding operation.



Birlec's steam tempering furnace for electrical steels

Its brick lined steel shell is fitted with an interior metal container to prevent the main brickwork from absorbing steam. Mounted on the inside face of the inner shell are electrical insulators carrying the heating elements, thus ensuring heat is imparted direct to the charge by means of the air circulation system. A centrifugal fan and baffles maintain temperature uniformity.

New range of Brazing Solders

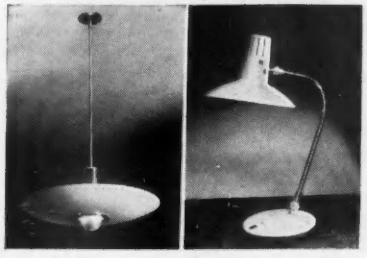
NEWCOMER to the British Market is a range of silver brazing alloys, a development of the American associate company of BAKER PLATINUM LTD., 52 High Holborn, W.C.1. Sold under the name of "Silvaloy," these solders are available in 12 grades to meet separate requirements. Four grades meet the requirements of B.S.1845, in types 3, 4, 5 and 6 respectively.

Philips New Contemporary Range

NEW venture by Philips Electrical Ltd., Century Hse, Shaftesbury Ave, W.C.2, is a range of contemporary styled lighting fittings for use with tungsten filament lamps.

The range includes two ceiling pendant fittings, the "Windermere," an indirect lighting bowl fitting stove enamelled ivory inside and out, with suspension rod in polished aluminium or

The "Windermere" and "Waverley" models



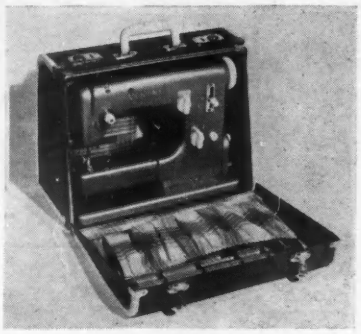
stove enamelled white, and the "Woburn," a semi-direct louvred bowl fitting stove enamelled white with polished aluminium or white rod. These two fittings are for use with the new Philips internal bowl silvered 200 W and 300 W lamps which effectively screen the light source from eye level without loss of light.

There are two similar models, a desk lamp, the "Waverley," and the "Wyvern," floor standard, which embody a similar aluminium reflector polished inside and stove enamelled white outside. The desk lamp has reflector and weighted base enamelled ivory with the adjustable support in polished aluminium tubing; the "Wyvern" floor standard has its mounting rod enamelled ivory with a polished oak or beech base. Completing the range is the "Woking" diabolo type wall fitting, which is for two lamps, is finished white inside, black outside, and has a polished aluminium bracket.

The Viking Sewing Machine

NEWCOMER to the home market is the Swedish "Viking" electric sewing machine supplied by VIKING SEWING MACHINE CO., LTD., 64 St. Mary's St, Ely, Cambs. Elaborate designs of embroidery, zig-zag stitching for overcasting edges and joining lace insertions and buttonholing are all accomplished without the use of any attachments. Buttons can be

This machine lives in a neat case



sewn on and snap fasteners secured whilst the "free arm" enables socks, stockings, etc., to be darned and garments patched by the machine. There is also a unique speed reducer for use when undertaking complicated work, and by adjusting a three-point switch the position of the needle is altered thus extending the scope of the zig-zag mechanism.

With a built-in light, flat extension table and a cream coloured plastic box housing accessories the machine is supplied in a wine and cream coloured case with compartments for foot-speed control and table attachment at £65 plus £12. 11s. 1d. purchase tax.

For the Electrical Trade

TRADE PUBLICATIONS

SWITCHBOARD COMPONENTS.—A new publication, "Ironclad switchboard components," by the GENERAL ELECTRIC CO., LTD., Magnet House, has been issued.

RADIO AND ELECTRICAL.—New comprehensive retail trade catalogue issued by JOHN E. DALLAS and SONS LTD., Dallas Building, Clifton St, E.C.2, covers Radio and TV accessories, components, test equipment, aerials, service spares and tape recorders.

CONDUCTORS.—A new pamphlet just issued by the LIVERPOOL ELECTRIC CABLE CO., LTD., 24 Queen Anne's Gate, Westminster, S.W.1, describes an installation of overhead conductor equipment in the Sandhole Colliery, Lancs.

FIRE EXTINGUISHER. — The latest "Chloroflash" fire extinguisher—a pressure operated chlorobromomethane extinguisher—is described in a brochure by NU-SWIFT LTD., Elland, Yorks.

NEW AND RE-CONDITIONED METERS—Details of their range of new and reconditioned meters and replacement service are given in the current catalogue of the ELECTRIC METER CO., Castle Circuit Hse, Torquay, Devon.

INDUSTRIAL BRUSHES AND BRUSHING WHEELS—Under this title, a new publication detailing products of W. CANNING AND CO., LTD., Gt. Hampton St, Birmingham 18, is now available.

LAMPS AND LIGHTING.—The Linealux 700 series of tubular lighting fittings was recently extended to include an all-insulated plastic range. The whole series is now listed in a 1954 catalogue issued by LINEALUX LTD., 142 Liverpool Rd, N.1.

HEATING EQUIPMENT.—"Isodrum" heating mantles for the handling of viscous materials are illustrated in a recent leaflet IOR/54 issued by ISOPAD LTD., 30-32 Rosemont Rd, London, N.W.3.

FANS.—"A true picture of a fan's value to the user" is the sub-title to a booklet, "Service Value," recently issued by CROMPTON PARKINSON LTD., Crompton Hse, Aldwych, W.C.2.

WASHING MACHINES.—Included in recent trade literature released by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., Peterborough, is leaflet H701-1 dealing with the firm's electric washer.

RADIO EQUIPMENT.—Carrier channelling equipment for radio routes is the subject of Publication R.E.B. 102 by AUTOMATIC TELEPHONE AND ELECTRIC CO., LTD., Strowger Works, Liverpool.

CONTROL SYSTEMS.—DACRON LTD., 32 Fitzroy Sq, W.1, have published, in a leaflet, details of their Planomatic control system which offers a new approach to the technique of visual planning and progress controls.

COMPONENTS.—The latest electrolytic capacitor made by the PLESSEY CO., LTD., Ilford, Essex, are described in a new catalogue No. 714.

Innovation by Siemens—the "Lumenette"

Siemens latest—the "Lumenette"

STRIP lighting is a new field for SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38-39 Upper Thames St, E.C.4, who have just launched their new "Lumenette" fitting.

Designed to provide small-scale strip lighting in the home, the fitting consists of a plastic holder incorporating a 35 W 12 in. architectural lamp. It is suitable for use in such places as kitchens, porches, halls and over mirrors, bedheads and desks. Main features are (a) absence of glare, (b) operation in any position, (c) easy fixing with two screws provided, (d) neither shade nor reflector required.

The holder is available in cream or green and complete unit is self-contained in an attractive package with a cut-out top flap for display. Price is 23s. 6d. complete whilst replacement 35 W lamps are priced at 12s. 4d. plus 18½% tax.

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Dissimilar Metals

ARTICLES on earthing and lightning which have recently appeared in the ELECTRICAL TIMES have reminded the writer of an experience which may interest your readers. Some years ago in Penang, Malaya, lightning struck a large house, the verandah of the upper storey of which was tiled with marble slabs 2 ft square and 1½ in. thick. The lightning evidently travelled down the lightning conductor (one of the very few houses so fitted), jumped across to a down pipe and then ripped diagonally across the marble floor, tearing the slabs away from the concrete and damaging considerably more than a few.

The whole system was a good many years old and the earth plate was dug up for inspection. There was the trouble; of all things, a brass terminal lug connected to the copper earth plate by means of a *mild steel* bolt which had corroded away!

Here was a case where a defective earth system was more dangerous than if no lightning conductor had been installed at all. It also proved the necessity of examining, if not testing, lightning conductor systems periodically. Incidentally, in replacing the earth plate we "found a home" for about half a sackful of discarded carbon brushes which were broken up and packed around the earth plate.—*K. Coombs* (Cape Town).

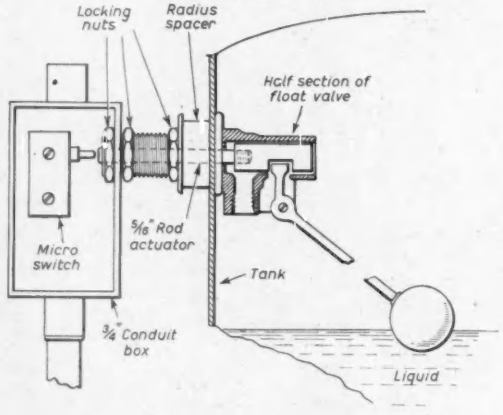
Micro-Switch Application

SOME time ago it was decided that we remove some storage tanks from floor level to a stage built close under the roof. When the job was well in hand it was realised that some form of float switch was required to give indication of the tanks becoming full, previously done by visual inspection.

Time was short and delivery of float switches were long, so we hit on the following gadget. Using ordinary ball valves, and micro-switches, all in stock, we got over the difficulty as illustrated. The micro-switches were mounted in standard ¼ in. oblong conduit inspection boxes, a hole being drilled in the side for entry of the long thread on the valves, which were secured by locking nuts. The valve seats were bored out and the valves drilled and tapped to take a 5/16 in. extension rod which actuated the micro-switch with the rise of the ball.

The switches were wired to an indicator panel near the pump control valves so the operator could tell at a glance when to switch over to an empty tank. As an extra precaution against overflowing of the liquid, a neon lamp gave indication that the panel was alive.—*C. P.*

The micro-switch, fitted as shown below, makes a useful substitute for a float switch



System Earth Faults

I HAVE noted the observations of your contributors, J. Coward and "1066," who both appear to be more concerned with other sections of the circuit under review than the specific problem for which it was first submitted, i.e., "an o.c.b. opening beyond actual point of fault."

The circuit is in operation as a radial feeder up to point "D" only, section "D"–"E" being left energised as explained in my original article. The alternative feed via "F" is interlocked with "E" as "A" and "F" are different sources of supply and are not intended to be paralleled. The area beyond "E" was originally fed direct from "A" until load necessitated the alternative feed via "F."

There is another feeder from the 6·6 kV busbars to area "C"–"D" which was not shown for simplification of circuit under review, as this is only used for limited supply in case of failure of the ·25 sq in. 11 kV feeder.

It is agreed that no more sensitive protection could be provided at point "A"–"B" by balanced c.t. relays but the cost was not considered justified in this particular case with a transformer unit of only 2 MVA, as transformer winding failures these days are very rare. Provided that the correct ratio of c.t. is chosen for the circuit to be protected and/or relays are set accordingly, this primary protection should clear internal and external faults on either side of the star/delta transformer.

The use of a tuned reactor is unsuitable for use with entirely underground feeders, where rapid isolation is essential, as intermittent faults are unusual in such circuits. The actual reactor in use is designed for an earth fault of 210 amps with a time rating of 30 secs.

Whatever form of protection in use at "A" it is thought that the o.c.b. at "D," with no time limit lag on the earth leakage trip, will operate before if not simultaneously with "A" with an earth fault under similar conditions. An earth fault on section "D" to "E" would, of course, not cause "A" to operate which is what is required.

The main disadvantage in such circuits is the misleading indication to the operator when investigating the cause of failure, not to jump to conclusions that fault is beyond the furthest o.c.b. found open.—*H. W. R. Ogden.*

Bell Transformer Rating

THE difficulty that Mr Coombs experienced in attempting to operate chimes from an 8 V transformer (25 Feb. issue) quite frequently occurs in this country. The answer, however, is quite simple, as most bell transformer manufacturers produce 4-8/12 V transformers as standard items. Having experienced difficulty myself when overseas of getting various equipment, I can appreciate that no 12 V transformer was readily available in Cape Town.

On one occasion, having changed an 8 V transformer for a 12 V unit, after a client had purchased a set of chimes, installed them himself and could not get them to work, I found that the solenoid would still not operate satisfactorily.

On a closer look, I noticed that the plunger had been oiled. After removing the oil from the plunger and internal cylinder of the solenoid, the chimes worked quite satisfactorily. Our customer, having had no luck when connecting the chimes to the 8 V transformer, thought a spot of oil on the moving parts might have been of some help.

Since then I have twice found the plunger of chimes oiled because they failed to operate properly. On both occasions they were battery-operated chimes and the fault was that the batteries had run down.—*W. Satchwill.*

NEWS OF THE WEEK

Export Prices are Main Concern in 1954

Chancellor's Economic Survey for Current Year

AS IN previous years the nation's main concern during 1954 will be to maintain and then increase its level of exports. An even more important factor, however, is one particular aspect of exporting, namely the question of prices. It is on price that the real challenge will have to be met this year, states the Economic Survey for 1954 presented by the Chancellor of the Exchequer last week. Recent price trends in export markets certainly offer no room for complacency, the Survey reads. The U.K. will only sell the exports required to pay its way abroad if exporters are able to offer prices, delivery dates and other terms which will attract demand. There is no longer a sellers' market abroad and there is keen competition in capital goods as well as consumer goods. The trend of our exports of capital goods had, in fact, afforded the most serious cause for concern. It is noted, however, that delivery dates for heavy U.K. equipment had shortened, but set against that are our competitors' cuts in prices.

The Survey sees no reason why there should be any difficulty in maintaining the 1953 level of exports, even allowing for a further decline in U.S. production. At home, demand and activity should be maintained and production higher. The level of home demand must not rise so high that it impedes the flexibility of industry and removes the incentive to develop the more difficult overseas markets. Nor, says the Survey, must it fall so as to check expansion, discourage investment and waste resources.

Return of the buyers' market abroad necessitates an increase in productivity and lowering of costs and prices. If the latter are raised by internal costs, we are taking a short cut to bankruptcy, the country is warned. This, it is added, is inevitable if increases in productivity are regularly outstripped by rises in wages, salaries and profits.

RAILWAY CONGRESS

A SURVEY of electric traction systems and their advantages and disadvantages, radiophonic communications, and protection of electric equipment will be among subjects discussed at the International Railway Congress to be held in London between 19 and 26 May. Over 450 delegates from more than 30 countries will assemble at Church House, Westminster. In addition to the conference, delegates will be afforded the opportunity of visiting electrical control rooms on the Southern Railway, and the Liverpool St.-Shenfield electrification project.

New Hall for Belgian Industrial Show

BELGIUM'S first International Technical and Industrial Exhibition is to take place at Charleroi between 18 September and 5 October. It will be housed in the newly built Palais des Expositions specially erected in the centre of the town for the handling of the heaviest equipment. The exhibition will be a specialised and a technical one including electronics and electro-technical engineering and electricity supply. There are a total of six halls, the largest being 9,600 sq metres (and equipped with o.h. cranes) and the smallest 6,000 sq ft. Charges are Bel. Fr. 400 per sq ft with additional charges for special positions. Further information may be had from the London agent, Mr W. H. Wadmore, of 56 Victoria St, S.W.1.

£12m. Orders for Power Plant for Turkey

CONTRACTS for the building and equipping of the dam and power station at Hirfanli, were placed by the Turkish Government last weekend with two British companies. The English Electric Co., Ltd. have secured orders for the supply of electrical equipment comprising four vertical Francis type water turbines and valves, four alternators, four transformers, six outdoor circuit-breakers, isolators, control equipment and various auxiliaries. Each turbine is rated at 35,000 m.h.p., rotating at 250 r.p.m. Coupled to the turbines are 31,250 kVA, 11 kV, 3-phase, 50 c/s alternators with closed circuit cooling.

The Hirfanli hydro-electric project is situated on the Kizilurak river and comprises a rockfilled dam, 280 ft high, and a power station to generate some 100,000 kW. Output of the new station is to be fed into Turkey's national grid system. Civil works will be carried out by George Wimpey and Co., Ltd.

Advance Programme of British Assoc. Meeting

PRELIMINARY details were released yesterday of the British Association's next annual meeting, which will be held in Oxford from 1 to 8 Sept., under the presidency of Dr E. D. Adrian. Sir John Cockroft is president of Section A, Physics, and Dr Willis Jackson president of Section G, Engineering. Their addresses will deal with recent developments in high energy physics, and new materials in engineering, respectively. Papers of electrical interest in Section G discuss the efficient use of fuel, the cross-channel power cable. Interesting papers in other sections include one on friction and adhesion of solids. There is also a discussion on recruitment to the engineering profession which should prove of importance. Details of the Annual Meeting can be obtained from The Secretary, The British Association for the Advancement of Science, Burlington Hse, London, W.1.

Ministry considers Safety of Electric Vehicles

MEASURES to ensure the safety of pedestrian controlled electric vehicles, especially while unattended, are being taken by the Electric Vehicle Association, we understand. The matter arose originally following an accident caused by a milk float to two children in September 1952. One of the children lost his life. Representations were subsequently made by Bermondsey Borough Council to the Minister of Transport asking him to make regulations for the complete immobilisation of the vehicles when left unattended. The Ministry has duly replied to the Council following discussions on electric vehicles in general with the representative Association. The Ministry state that the majority of manufacturers have incorporated some feature—a removable key, mechanical locking device or electric switch—beyond the reach of small children, to guard against accidental or non-authorised removal of the vehicle. Members of the Electric Vehicle Association have agreed to the principle of certain minimum safeguards which all can adopt within the limits of individual design. Future production will incorporate these and other safeguards.

A letter has also been sent to trade Associations representing the users of these vehicles asking them to point out the importance of using the safety devices to drivers. The Ministry does not consider that further regulations would be beneficial.

Electricity Board extends Hire Purchase Facilities

HIRE PURCHASE facilities for appliances which are outside the scope of the Hire Purchase and Credit Sale Agreements (Control) Order are to be extended to a maximum period of ten years in the East Midlands. The Area Electricity Board announced their decision to members of their Consultative Council at the latter's meeting in Nottingham last week. This long-term purchase scheme will thus become available for such items as cookers, immersion heaters, washboilers and storage water heaters. The decision should have the desired effect of stimulating sales, as the low quarterly rentals will bring the appliances within the reach of those with the lowest incomes. About £1. 1s. per quarter should suffice to purchase a modern cooker, whilst half that amount will buy an immersion heater. The latter will include wiring, plumbing and the lagging jacket.

RURAL SUPPLIES IN EAST MIDLANDS

AT the same meeting, the Board's chairman, Mr C. R. King, said more farms were taking a supply of electricity in the Area than in any other Board's area. The number connected at 31 Mar. 1953 was 16,666, or 62% of the total. During the past nine months work in this field had been greatly accelerated and a further 1,400 farms were connected in the year ended last month. This formed the first part of Board's long-term programme of rural developments covering the five years to 1958. Cost of that programme, calculated to carry electricity to another 6,550 farms, would be about £4,700,000, he said. Mr King explained that the Government did not provide the cash, it merely allowed the Board to increase its capital expenditure, but the Board had still to find the money. That fact was not generally appreciated.

SECOND 5-YEAR PLAN FOR RURAL SUPPLIES

HAVING provided 60,000 rural premises with electricity during the first five years since vesting day, the Eastern Electricity Board has now embarked on its second five-year programme of rural electrification, during which it is hoped to connect 50,000 more premises. This appears to be a formidable task considering that the work becomes more difficult as development proceeds. These two totals include 5,600 and 6,000 farms respectively and the Board is to continue its policy of considering supplies to villages and hamlets as important as farms. Since 1949 the Board has supplied hamlets with six premises or more without any capital contribution, revenue guarantee or line rental. This means that the cost of electricity is no more than in the towns, and as this has proved entirely satisfactory, the scheme will continue. Smaller groups of premises are supplied on standard tariffs and in some cases there is an additional line rental for not more than seven years. We hear that as an extra incentive line rental terms have been reduced and the cost spread over consumers as a whole. The Board is embarking on a system of zonal development in addition to individual hamlets and farms.

New Company in Malaya

MALAYAN branch of the General Electric Co. has been converted into a separate Singapore private registered company. The new firm will be known as the General Electric Co. (Malaya), and has an authorised capital of $M4,250,000. Mr Leslie Gamage is chairman, and there are five other directors resident in Malaya.

OFFICIAL PUBLICATIONS

BRITISH STANDARD. B.S. 327, Part 2: Derrick Cranes (Hand-Operated).

ECONOMIC SURVEY 1954. H.M.S.O. 1s. 6d. (see page 527).

Gas Council asks for Report on Stamps Scheme

THE idea of selling "electricity saving stamps" to help consumers pay their quarterly accounts, has apparently aroused the interests of our contemporaries in the Gas industry. The scheme has been running successfully for some time now in the N. Western Electricity Board's area and we hear that the Gas Consultative Council has asked if they could be given a report on the operation of the scheme.

The scheme was introduced just over a year ago at the suggestion of the Electricity Consultative Council, and in that time the milestone of one million stamps (2s. 6d. each) sold, has been passed. Even this success is scarcely satisfactory enough apparently for the Council who are eagerly seeking ways of extending the scheme. Their latest proposal is that special window displays should be arranged in the Board's showrooms to draw attention to the service. It is their belief that there is plenty of scope to sell more stamps than the present 25,000 a week.

Lucky Number

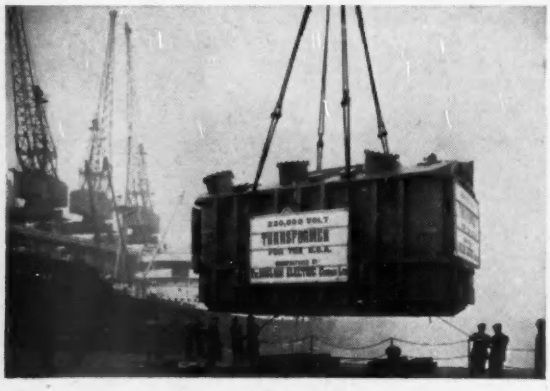
WINNING guess in the E.I.B.A.'s competition to guess the consumption of electricity during the Electrical Engineers' Exhibition was 445,509. First prize of a light meter went to Mr S. A. Werner of Leyton. Actual reading at the close of the exhibition was 445,819. Second prize, a clock, went to Mr E. Cumberland of Brush with his guess of 444,444, and third prize, a fire, to Mr A. S. Brightman of Luton, with 442,628. There were seven other prizes, including two fires, a clock, and coffee percolator.

Scottish Plans to spread Technical Information

PLANS to provide up-to-date and technological information to medium- and small-sized firms in Scotland were reviewed following a meeting of the executive committee of the Scottish Council (Development and Industry) last week. It was announced that an experimental survey to find the best means of doing this was to be carried out with the aid of a Government grant. It had been found, it was stated, that the need was not primarily for more scientific and technological education, but rather for better transmission of existing information to firms, especially those who could not boast their own research departments, in addition to services already provided by research associations. Application for a grant to enable a survey to be made in Scotland to prove this point by an actual experiment, was made about a year ago.

It is proposed that a team of investigators would be brought together to visit firms, and if the survey proved successful it would point the way to a permanent service. Those visited would represent a cross-section of the type of industry in mind, and it was expected that this initial survey should be completed by Aug. 1955.

This is but one of a number of schemes to raise the prestige of Scotland as an important industrial and trading nation. Efforts are being made to attract more industry north of the Border—and we hear that five firms (four American) are considering establishing factories there—export orders are mounting, nothing has been spared in time and trouble to promote the Scottish Industries Fair next September and there is to be a "Scottish Week" in Copenhagen shortly.



A 230 kV transformer being shipped at Liverpool docks en route to the U.S. It was made at the Stafford works of English Electric Co., Ltd. and is one of the first big h.v. transformers ever made in this country for the U.S.A. The equipment is destined for Folsom Dam, California, and was ordered by the U.S. Bureau of Reclamation

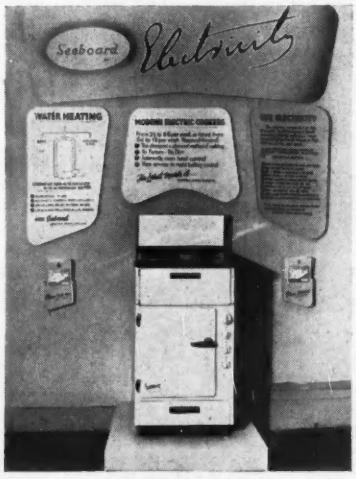
Employment of Electrical Engineers during 1953

A REVIEW of the activities of the Professional Engineers' Appointments Bureau during 1953, shows that over 7,600 engineers were submitted for vacancies notified in Civil, Mechanical and Electrical Engineering. Among the latter, vacancies in the light current field predominated and engineers with experience in electronics were relatively easy to place. Throughout the year the Bureau conducted many hundred interviews with employers and engineers and in that way was able to satisfy numerous requirements. The Bureau state that it would be very helpful if employers notified them of as many vacancies as possible.

Among the general observations made were the facts that the problem of placing the older engineer remained as acute as ever, and that the possession of a University Degree was very often the deciding factor even irrespective of experience. There appears also to be an increased reluctance on the part of younger engineers to go abroad, and another difficulty facing the Bureau at present is the shortage of living accommodation.

Public Speaking Finalists

AREA finals for E.D.A.'s Public Speaking Competition have taken place in Scotland. In Edinburgh recently, Miss B. Gillies on the H.Q. staff of the S.W. Scotland Electricity Board, and Mr J. A. B. Maben, of the S.E. Scotland Board's Galashiels office, qualified to take part in the National Finals later this month. Mr Maben was placed second last year. Runners-up were Miss P. Gallacher, of the S.W. Scotland Board, and Mr P. G. Cope, of the S.E. Scotland Board.



This is a significant display in the current arguments for and against gas or electric cookers in council houses. This display was erected in the reception room of Brighton Corporation's housing department. As council tenants go there to sign their agreements and get the keys to their houses, Seeboard's display might well have the last say in whether or not a tenant uses gas or electricity

Crowborough (Sussex) showrooms of the S.E. Electricity Board have recently been modernised and enlarged to cater for the growing domestic and agricultural needs of the area. These premises were opened originally in 1928. At that time the showroom served some 300 consumers, at the present time that number has grown to 7,000. It is notable that some members of the 1928 staff are still working there to-day

REVERSED POLARITY CAUSES DEATH

AT an inquest at Stowmarket last week, evidence was given of reversed polarity in house-wiring. A verdict of death by misadventure was recorded on a 31-years-old stockman found electrocuted in a greenhouse. An inspector of the Eastern Electricity Board said that polarity was reversed between the main switch and the meter terminals. Interior installations at the house had been correctly wired as far as the main switches. The transposition was between the mains switch and the meter, normally the Board's responsibility. He said both wires were brown instead of the usual red and black. Polarity was consequently wrong throughout the house. Another Board official described the wiring as highly dangerous.

The coroner was told that an electrical heating bar had recently been fitted in the greenhouse. A trailing covered flex had been run from a lamp socket in the lavatory. The dead man was found with the broken heater element in his burnt hands. The switch in the lavatory was turned off. He had been watering the plants and he was wearing boots with steel toe-caps and heel-irons. It was also stated that the heater was unguarded.

Jury Recommendations at Newcastle Inquest

USE of the same key to open 17 cubicles containing live apparatus was described as fatuous and stupid by a Newcastle coroner recently. A verdict of accidental death was returned on two electricians. Evidence was given that an overhaul was to be made of an oil circuit-breaker in one cubicle and that the apparatus had been made safe and earthed, the doors being left unlocked but closed. The men unlocked the doors of the adjoining cubicle, however, and started work. The jury recommended there should be different locks on each cubicle, that each cubicle should have a system of warning lights to show whether the apparatus inside was live or dead, and that the number of the cubicle should be shown inside the doors as well as outside.

Economics for Batti-Wallahs

PRINCIPAL guest at this month's luncheon of the Batti-Wallahs Society at the Connaught Rooms was the noted economist George Schwartz, who gave his audience an amusing insight into the uses of that much maligned but very useful person, the economist.

The company took advantage of the occasion to wish a member of long standing, Mr W. E. Warrilow, *bon voyage* on his forthcoming journey to New Zealand.

Lifts for Madras

GENERAL Electric Co. of India Ltd., agents for Express Lift Co., Ltd., has received an order worth about £60,000 for lifts in the new United India Fire and General Insurance Co., Ltd.'s building in Madras. This brings the total value of export orders received by Express Lift Co., Ltd. in recent years to well over £1,100,000.

The First Half-Century

The situation at Torquay with respect to the electric light and power station is one worthy only of comic opera. Nowhere else would a committee of local experts in the building trade be permitted to overrule the experience of the last 20 years, and propose to erect a generating station with rubble walls—to carry a 20-ton crane—and wooden roof within seven feet of the tops of boilers. Extension of the lighting business and coming of trains necessitated a new station and the borough surveyor and electrical engineer got out a scheme with plans, estimates, etc. Then came a timid council, frightened at the expense, and its local wiseacres, who knew nothing of the requirements of electricity works, but had a single eye to cheeseparing. They have now compromised as to site and allowed a chimney stack of adequate size, but on rubble walls and wooden roofs they stand firm. So in a year or so we shall probably have plenty of copy and correspondence respecting the burning down of the new generating station at Torquay.—*From our issue of 7 April, 1904.*

Revo Electric Co. Ltd. have recently added eight new vehicles to their transport fleet. Three of these large and impressive vans are shown in our illustration. They are 8-ton articulated vans with 30 h.p. Ford units powered by Perkins diesel engines

THE TUBEWRIGHT—A new Industrial Film

LATEST addition to Stewarts and Lloyds' film lending library is a 25-minute black and white sound film describing the work of their subsidiary company, Tubewrights Ltd. It traces the use of the hollow structural member on which tubular steel is based, recalling nature's examples in the bird's quill and the corn stalk. The 19th century engineers adopted the idea in their work, two examples being the Menai Straits and Forth Bridges, but it was not until the development of modern metallic arc welding that the Tubewright really got into his stride.

One of the most important aspects of steel tubes is their high strength to weight ratio. This is emphasised in the film when it demonstrates the application of steel tubes as structural members in bridge building, crane jibs, materials handling equipment and in building work.

Portland Players present "Night Must Fall"

ON Wednesday and Thursday last the Portland Players, the B.E.A. Sports and Social Club's dramatic section, presented "Night Must Fall," by Emlyn Williams, at the Duthy Hall, Southwark. This selection showed remarkable self-assurance considering the number of professional performances of this play recently. There was reasoned argument by John W. Barbet as the Lord Chief Justice, and strong portrayals by Anthony Moss as the Welshman—Dan; by Miss Renee Futcher as the "invalid" old lady; Miss Margaret McPherson as the breezy nurse and Mrs M. Hutchinson as the blunt cook who was seldom at loss for an answer. More restrained performances were given by Miss Cynthia Gidley as the niece companion, Miss June Dodds as the maid, Geoffrey Walker as Inspector Belsize and Hubert Laurie as the boorish suitor. It was a most enjoyable evening's entertainment.

Sayings OF THE WEEK

"The use of small bore pipes with forced circulation for small scale central heating was a promising development. While easier to install the major advantage might lie in simpler automatic control," . . . SIR CHARLES ELLIS addressing the British Coal Utilisation Research Association.

"What state are we getting into if a man cannot work after 8 o'clock?" queried HIS HONOUR JUDGE LAWSON CAMPBELL, chairman of the Cambridgeshire Bench of Magistrates, when a Swavesey shopkeeper was summoned for selling an electric light bulb to a customer after 8 p.m. The shopkeeper was fined 5s.

"As an industry we have as high a reputation for fair dealing and for considering the welfare of our workers as any in the world," . . . LORD CITRINE, in a message to the North West, Merseyside and N. Wales Division.

NEWS IN BRIEF

Prices for tungsten ores of standard 65% grade and ordinary quality have been increased from 2 Apr., the Ministry of Materials announced. Wolframite goes up from 145s. to 155s. and Scheelite from 140s. to 150s. per long ton delivered consumers' works.

We would like to make it clear that copies of *The First Five Years*, a booklet about the B.E.P.C. referred to last week, will be sent free to all delegates at this year's conference. The charge of 2s. applies only to those not attending.

A cordial welcome is extended to the first issue of *Northern Lights*, monthly magazine of the North West, Merseyside, and N. Wales Division of B.E.A. Volume 1, number 1 appeared last week. It supersedes the *Gridiron Gazette* and *Beacon*.

Fiftieth anniversary meeting of the International Electrotechnical Commission will be held at the University of Pennsylvania, Philadelphia, between 1 and 16 Sept.

London Chamber of Commerce has now successfully opposed two applications by South American firms to register the word "London" as a trade mark.

The £200,000 Ewell Technical College has been opened by Lt.-Gen. Sir Ronald Weeks.

Tees-side lift manufacturing firm of Pickerings Ltd. is celebrating its centenary this year.

We have been asked to point out that only flameproof models of radiators made by Dimplex Ltd. are free from purchase tax when used under hazardous conditions, not gas-tight models as stated on page 361 of our 11 Mar. issue.

QUESTIONS IN PARLIAMENT

Generating Capacity

REPLYING to Mr A. Palmer last week, Mr L. W. Joynson-Hicks said no estimate of the capacity of new generating plant to be commissioned in the next 10 years to enable industrial electrification to reach an installed h.p. per worker comparable to the U.S. productivity standards, could reasonably be given. Answering a further question he said development of industry envisaged the commissioning of some 17,000 MW of new high efficiency plant in the next 10 years, costing at present prices over £1,000 million. Reduction in output from old plant will depend on increase in demand for electricity and therefore the saving in fuel could not be estimated.

Fuel and Power Resources

WHICH major recommendations of the committee on national policy for the use of fuel and power resources had been carried out? asked Mr A. Palmer. He was told that 12 of the committee's 14 main recommendations had been effected wholly or in part. Two recommendations were not accepted but alternative action had been taken to achieve their underlying purpose. A full statement in *Hansard* on the subject would be considered, but no promise was given.

Snowy Mountain Project

THE President of the Board of Trade stated that he was maintaining close touch with the contracting industry about Australia's Snowy Mountain scheme. He had been asked by Mr Robson Brown what assistance was given to contractors to secure a large part of the £40 million worth of civil engineering work. It appeared, however, that U.K. companies decided not to tender for those contracts.

Dunston's Chimneys

EFFORTS to prevent air pollution from the chimneys of Dunston power station were explained by Mr L. W. Joynson-

Hicks. He said cyclone grit arrestors on chimneys 1 and 2 were working at 73% efficiency, those on chimneys 3 and 4 at 68%, and electrostatic precipitators on chimneys 5 and 6 at 97%. Answering further questions from Mr Popplewell, he said figures for chimneys 1 to 4 related to much older plant and the problem's solution lay in the gradual exchange of load to more modern plant, but he could hold out little hope that it would be practicable to insert the electrostatic precipitators into the old chimneys. This did not satisfy Mr Popplewell who gave notice that he would raise the matter on the Adjournment.

Spondon's Pollution

ONCE again Mr A. J. Champion raised the question of pollution from the chimneys of Spondon power station. He has persistently complained for some years now. Last Friday, Mr L. W. Joynson-Hicks admitted that the power station was partly to blame, but said that the B.E.A. could not accept all responsibility for the contamination. In the first place other buildings also added to the pollution, and secondly, all plant was installed before nationalisation. The B.E.A. was preparing plans which will help in alleviating the position. The 22 chimneys were to be eliminated and one, 350 ft high, built with grit arresters and fans. The changes should take effect during the summer of 1955.

Train Control

PROGRESS report on investigations of automatic train control arrangements following the Harrow disaster of 1952 was asked for by Viscountess Davidson. Mr A. Lennox-Boyd said rigorous efforts were being made to develop apparatus to the necessary standard of reliability, and large-scale trials were in progress, but he warned it might still be some time before the required standard was reached. To date there had been too many breakdowns to give complete satisfaction.

Trade Talks

A STATEMENT on discussions between the U.K., America and France on the possibility of extending East-West trade was made by Mr P. Thorneycroft last week. Relaxation of the controls on strategic goods compatible with security arrangements was agreed upon and discussions would now take place with other friendly Governments. It would be proposed, he said, that all should examine the scope and effect of the controls, category by category. This will probably take about three months and changes would be made by stages. He said the Americans were in complete agreement with us as regards the expansion of civilian trade with Russia. As regards orders already received, Mr Thorneycroft said authority had been given for goods not requiring export licences. As to others, a decision would have to await the discussions.

Goods for Russia

REGULATIONS concerning the export of diesel engines and the quality of machine tools sent to Russia was the subject of questions by Mr W. L. Wyatt last week. There are, however, no specific rules for these exports and Mr D. Heathcoat Amory said it depended on the type of engine. As a result of recent negotiations, application to export £21,900,000 worth of machine tools, tin plate and rolling mill plant had been received, and £1,350,000 worth had been approved to date, he said. He advised that any manufacturer uncertain as to whether there was an embargo on his particular product should contact the Board of Trade. Decisions often depended on a narrow detail of specification.

Electric Fishing

USE of electrical methods of fishing were confined in this country to fresh waters, explained Sir T. Dugdale last Thursday. Experiments in capture of sea fish were in progress. He said electric fishing was used by river boards and others concerned with fishing management as a convenient and economical method for restocking, artificial propagation, removal of unwanted species, and scientific experiment. It had not yet been used to catch fish for sale as food.

ELECTRIC SUPPLY NEWS

Agecroft

A DIRECT colliery to power station link is to be established at Agecroft, North West, Merseyside and North Wales Division, B.E.A. The disused Agecroft colliery, where there is about 100 million tons of coal, is to be reopened by the National Coal Board, and when production starts (about 1961-2), will feed supplies to the nearby power station. It is understood that the station will take about 450,000 tons annually, but the method of conveying the coal is still under consideration.

Neath

Since vesting day, the South Wales Electricity Board had spent about £250,000 on improving electricity supplies in Neath rural district, the Board have told the R.D.C. after a complaint that the supply was not satisfactory. The Board pointed out that conditions in the rural district had been a source of concern to the Board since vesting day. Although extensive work had been carried out over the past six years there remained matters which still needed attention. Since vesting day the Board has established a complete 11 kV system in the Neath Valley, and 16 new substations had been constructed. Similar work had also been undertaken in the Dulais Valley. Because of the works which had already been carried out the Board was now in a position to proceed with further plans which would result ultimately in satisfactory supplies in the rural area.

Unfortunately, the Board were hampered by the fact that a high percentage of the service lines leading to consumers' premises in the area were in a dilapidated condition. In consequence, a large proportion of the Board's resources had to be diverted to reinstating and renewing the worst of these services. This had greatly delayed the progress of system improvement works.

N. Ireland

THE Minister of Commerce was last week asked in Stormont if he had considered the advantages of a reciprocal electrical scheme linking up the Scottish hydro-electric system by submarine cable with Northern Ireland. Replying, Lord Glentoran said he had been advised that, as the result of recent investigation, that the linking of the two electrical systems by such means would not be an economical proposition.

North of Scotland

A DISTRIBUTION scheme contract valued at £300,000 has been placed by the North of Scotland Hydro-Electric Board with B. French and Co. Under the scheme electricity will be taken to isolated parts of the counties of Inverness, Nairn, Moray and Banff. Some of the villages to which the scheme will take electricity are Farr, Foyers, Errogie, Galcantray, Duthill, Coylum Bridge, Lynchat, and Chapelton of Glenlivet, and when it is completed in four to five years electricity will have been made available to 4,250 farms and 5,350 other houses, including farm servants' cottages. The scheme, to cover a very thinly populated area of over 1,000 sq miles, involves the erection of about 135 miles of h.v. lines and 130 miles of l.t. lines. The cost to the Board will be about £250 per consumer.

Oldham

TO celebrate the diamond jubilee of the local electricity supply, employees and former members of the staff attended a tea party at the Town Hall. The initial power station in Gas Street was opened in March, 1903, and had a capacity of 192 kW, but with expanding demand it was decided to move the plant to the present site of the Greenhill power station, which was opened in June, 1903.

LIGHTING SCHEMES

Basingstoke. The Corporation is recommended to seek sanction to borrow £4,830 for improving street lighting in Brook Street, Chapel Street and Kingsclere Rd.

Deal. The T.C. is to consider a scheme for converting lighting in certain streets from gas to electricity.

Wallasey. It is proposed to convert street lighting east of Seabank Rd from gas to elecricity at a cost of £6,550.

COMPANY ACTIVITIES

SIR HAROLD WERNHER, chairman of Ericsson Telephones, makes a good point in his annual statement.

He calls attention to a latent home demand for electrical equipment which could be released if (1) sufficient materials were available, (2) if export sales were less necessary to secure. He referred to the development of shared telephone equipment and thus reminded us all that the ordinary person still finds it just as difficult to get a private or unshared telephone line as during the war. Sir Harold, who says that increased foreign competition, especially German and Japanese, was largely responsible for last year's slight fall in Ericsson's profits, says there is likely to be a considerable demand for full telephone service when sufficient equipment becomes available.

The A.E.I. is a perfect example of the wide-spread electrical undertaking to which I referred last week. Sir George Bailey, the chairman, revealed at the meeting, that its manufactures range from a "massive contribution to the installation of new B.E.A. generating plant, to the latest atomic, T.V. and motion film equipment." Total shipments by A.E.I. last year rose by 13% to a new high level of £86 millions. But orders declined to £124 millions compared with £138 millions at the end of the previous year. This still represents a "comforting" total, according to Sir George, who also feels it brings some compensating advantage as it enables shorter delivery dates to be made, which is important at a time when competitors, especially German and Japanese, are taking "desperate measures." A.E.I. again made an impressive contribution to exports. But Sir George sounded a warning. Continental and Japanese firms are accepting orders at extremely low prices and short deliveries. "We shall," he said, "be able to offer effective competition in the matter of delivery, but the low price level is a very serious matter and demands investigation from all angles. A weapon used by our foreign competitors is that of quoting very favourable terms of payment, including long extended credits. In some cases a complicated system of employing several different currencies has been used, and even barter."

Murphy Radio is another company very glad of a soft Income Tax cushion. Consolidated profits fell from £415,032 to £353,572. But as tax dropped from £274,092 to £208,234, the net profit was £4,398 higher at £145,338. Undeterred by the lower trading results, Mr E. J. Power, the chairman, puts the dividend up from 10% to 15% on a capital increased to £700,000 from the previous year's £500,000.—*From our City Correspondent.*

Associated Electrical Industries Ltd.

A record rate of production was reached by this group in 1953, Sir George Bailey stated at the annual general meeting last week. Shipments invoiced both home and abroad at £86·1 millions were 13% higher than for the previous year. Shipments abroad were actually 14% up —again a record for the company. The board of directors view the future with sufficient optimism to justify embarking upon a further long term expansion plan for the manufacture of heavy electrical plant and steam turbines for both the M.-V. and B.T.-H. Cos., while the Edison Swan and Ferguson Pailin Co.s are also expanding their facilities

British Aluminium Co. Ltd.

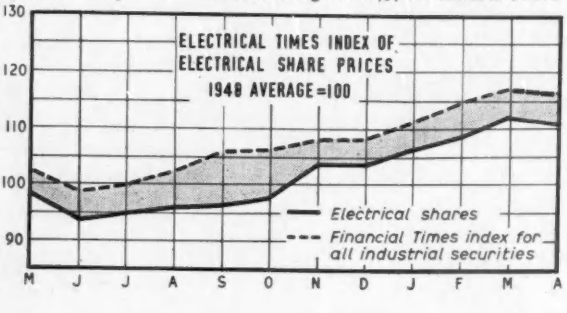
With a substantial reduction in the group profit for 1953 the Ordinary dividend is cut by 2% to 10%, with a final dividend of 6%. The group trading profit amounts to £882,117 (compared with £2,460,991 for the previous year) after charging depreciation and transferring £100,000 (*£300,000*) to plant replacement reserve.

British Industrial Plastics Ltd.

At one for two scrip issue was announced at the annual general meeting last Thursday. Mr K. M. Chance, the chairman, said it was the Board's intention to declare an interim of 7½%, as last year, on the existing Ordinary capital, probably early in September.

Lancashire Dynamo Holdings Ltd.

With a final Ordinary dividend of 8½% the total is again 14%, to which a bonus of 1½% is added. The group net profit for the year ended 31 Dec. last (before taxation) is £505,454, compared with £488,302 for the preceding period.



Seasonal decline in share prices preparatory to the Budget was only slight. Both indices fell during March, most marked decline being in respect of electrical shares, where the "Electrical Times" figure fell from 112·6 to 111·6. The "Financial Times" index for all industrial shares fell by only 0·7 to 116·3

Reliance-Clifton Cables and Industrial Products Ltd.

To mark the centenary of the founding of the manufacturing business now owned by this concern, the directors propose that £39,250 be capitalised from general reserve in paying up in full 39,250 unclassified Preference £1 shares to be issued as 5% Cumulative Preference shares on the basis of one for each £4 Ordinary stock held. The directors also recommend that £117,750 be capitalised from share premium account in paying up in full 117,750 Ordinary £1 shares, to be issued on the basis of three for each £4 Ordinary stock. Consent of the C.I.C. has been obtained. The proposed issue does not imply any increase in the total amount of dividend.

A. Reyrolle and Co. Ltd.

There is a final Ordinary dividend of 7½%, plus a special 2½% capital distribution (not taxed). The interim was 6¼%. For the previous year the total distribution was 12½% on the smaller capital. For the year ended 31 Dec. last the net profit is £1,159,105 as against £907,506 for 1952.

E. Shipton (Holdings) Ltd.

Dealings began last Monday in the 2s. shares of this concern, of which half of the one million were placed privately recently. The company was formed last month to acquire the share capital of the two operating companies—E. Shipton and Co., Ltd., and Industrial Appliances Ltd.

Superheater Co. Ltd.

After charging increased taxation, and including interest, the profit for 1953 is £220,493, which is £41,304 more than for the previous year. A final dividend of 30% makes a total distribution for the year of 40%, as against 35% previously. The directors propose a free scrip issue of one Ordinary for two shares held, and an "A" Ordinary scrip issue of one for two held. Consent of the Capital Issues Committee has been received.

G. and J. Weir Ltd.

The consolidated net group surplus for 1953 has been increased by £233,871 to a total of £804,269. With a final dividend of 16%, the total distribution for the year is raised by 4% to 21%.

Allen West and Co. Ltd.

In addition to a dividend of 15%, as before, a bonus of 2½% is recommended. The group net profit for the year ended 31 January last is £339,000 (*£429,475*), according to the preliminary report.

Dividends Declared

British Electric Resistance Co. Interim of 2½% (5%) but on doubled capital.

J. and F. Stone Lighting and Radio. Interim of 10% (*same*) on capital recently increased by 50% scrip issue.

Max Stone. Interim of 20% (*same*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders, unless otherwise stated.

9 Apr.—Belfast T.C. Heating and ventilating plant for 33 kV switch-house at power station West.—Advertised in 4 Mar. issue.

9 Apr.—Glasgow T.C. Accessories for lighting dept., in year from 1 June.—See 18 Mar. issue.

9 Apr.—Harrow U.D.C. Sodium lighting at Bushey Heath.—See 1 Apr. issue.

9 Apr.—Co. Antrim. Heating and lighting at Whitewell school.—See 1 Apr. issue.

9 Apr.—Surbiton T.C. Improved street lighting along Kingston Rd.—See 25 Mar. issue.

10 Apr.—Bournemouth T.C. Street lighting units.—See 1 Apr. issue.

10 Apr.—Chadderton U.D.C. Concrete street lighting columns.—Advertised in 1 Apr. issue.

10 Apr.—Ipswich T.C. Equipment for improved street lighting in 1954-55.—See 1 Apr. issue.

10 Apr.—Manchester. Electrical equipment for Municipal College of Technology.—Advertised in 25 Mar. issue.

10 Apr.—Manchester T.C. Trolley wire for Transport Dept.—Advertised in 1 Apr. issue.

10 Apr.—Thetford T.C. Wiring, etc., at Waterworks pumping station. — See 1 Apr. issue.

12 Apr.—Bideford T.C. Street lighting on various estates, etc.—See 1 Apr. issue.

12 Apr.—Bromley T.C. Improved street lighting along Westmoreland, Hastings and Tweedy Rds and Bromley Common. —Advertised in 25 Mar. issue.

12 Apr.—Harwich T.C. Five sets of sewage pumps, two comminutor sets and ancillary equipment at Fernlea Rd station.—See 4 Mar. issue.

12 Apr.—Durham. Installation in Cambridge House Hostel.—See 1 Apr. issue.

12 Apr.—Plymouth T.C. Tenders invited for provision of scheme of illumination during 1954. Documents from Stores Officer, Municipal Offices, Athenaeum Pl, Lockyer St.

12 Apr.—Plymouth T.C. Supply of 430 reinforced concrete street lighting columns and lanterns in class B. City Engineer, The Guildhall.

12 Apr.—Ryton U.D.C. Electric lighting and heating installation in total of 63 houses on Park Field North estate. Surveyor, Council Offices, Ryton Tower, Ryton-on-Tyne.

13 Apr.—Knaresborough U.D.C. Street lighting for part 2 of Meadowside scheme.—See 18 Mar. issue.

14 Apr.—Aberdeen. Supply and erection of 36 concrete columns (25 ft), and lanterns with 250 W mercury vapour lamps along A.96. County Rd, Surveyor and Engineer, 4 Albyn Pl, Aberdeen. Deposit £2. 2s.

14 Apr.—Dublin. Tubular steel poles for public lighting.—See 1 Apr. issue.

14 Apr.—Penzance T.C. Supply of electric lamps during year from 1 Apr. Borough Engineer and Surveyor, Municipal Buildings.

15 Apr.—Berwickshire. Installation in secondary school at Duns.—See 18 Mar. issue.

15 Apr.—Dublin. Revision of electrical system at St. Kevin's Hospital, and new installation in extension. Consulting engineer, N. Mathews, 42 Fitzwilliam Pl. Deposit £10.

15 Apr.—Edinburgh T.C. Electrical installation in former St. Thomas's Civic Restaurant. City Architect, City Chambers.

16 Apr.—Edinburgh T.C. Electrical work in 130 houses in Clermiston Development No. 4. City Architect, City Chambers.

16 Apr.—Kincardine. Installation of electricity at Catterline primary school. County Architect, 34 Market Sq, Stonehaven.

16 Apr.—Londonderry. Installation at Magherafelt intermediate school.—See 25 Mar. issue.

17 Apr.—Galashiels T.C. Street lighting units in Channel, Market and Paton Sts. —See 25 Mar. issue.

17 Apr.—Richmond (Yorks) R.D.C. Pumping plant.—See 18 Mar. issue.

17 Apr.—Durham. Installation in 16 houses.—See 1 Apr. issue.

19 Apr.—Ellesmere Port U.D.C. Supply to various estates of 150 concrete street lighting columns, class B, 15 ft, and totally enclosed lanterns. Council's Engineer and Surveyor, Queen St.

21 Apr.—Fifeshire. Installation in High School at Kirkcaldy.—See 25 Feb. issue.

21 Apr.—Newcastle-on-Tyne T.C. Supply and installation of washing and mangling machines for Hindhaugh St block of flats, laundry. City Architects, 18 Cloth Market.

23 Apr.—Birmingham T.C. Installation of lifts and lighting and power in blocks of flats on Holly Bank Farm estate.—See 1 Apr. issue.

23 Apr.—Heckmondwike U.D.C. Installation in 14 houses on Dale Lane estate. —See 1 Apr. issue.

24 Apr.—Ashington (Northumb.) U.D.C. Electrical installations and supply of electric cookers in 80 houses being built on Darnley Rd site. Engineer and Surveyor, Council Offices.

26 Apr.—Goole T.C. Supply of concrete and steel columns, conversion units, lanterns and auxiliary gear, flashing beacons. T. Waterfall, Borough Surveyor and Water Engineer, Municipal Offices.—Advertised in this issue.

26 Apr.—Lanark T.C. Supply, erection, etc., of 55 lighting units along route A73. —See 1 Apr. issue.

26 Apr.—West Riding. Rewiring of Bentley New Village school; and conversion to electricity at Pontefract Love Lane School.—See 1 Apr. issue.

27 Apr.—Peterborough T.C. Supply and erection of 24 steel columns and 140 W sodium discharge lanterns to group A, and 150 cast-iron columns and 80 W mercury vapour lamps to group B along various roads. City Engineer, Town Hall. Deposit £2 2s.

28 Apr.—Swansea T.C. Electrical installation in new fire station in Grove Place. Applications by above date to Borough Architect, The Guildhall. Deposit £2.—Advertised in this issue.

3 May—West Riding. Rewiring at Mexborough Roman Terrace and Tadcaster schools.—See 1 Apr. issue.

7 May—Belfast T.C. CO_2 fire fighting equipment.—Advertised in 1 Apr. issue.

17 May—Stepney B.C. Installations in flats in Sidney St. scheme.—Advertised in 1 Apr. issue.

24 May—Stourbridge T.C. Supply and erection of electrically and diesel driven vertical spindle centrifugal pumps and auxiliary equipment for replacement at Enville St pumping station of Main Drainage Board. Council's consulting engineers, John H. Haiste and Partners, Norwich Union Chambers, Clarence St, Gloucester. Deposit £3. 3s.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 107 queries answered this week

"Victor" bell transformers, makers of? T.E.—V. and E. Friedland Ltd., Lower Heys Mills, Macclesfield, Ches.

"Widalite" fittings, makers of? E.E.B. —Holophane Ltd., 53 Elverton St, S.W.1.

"Ladybird" lawnmowers, makers of? L.E.B.—A.M.I. Lawnmower Co., Ltd., Elmbrook Mill, Reading Rd, Wokingham, Berks.

"Anderson" charging plugs and sockets as used on electric vehicles, makers of? C.F.—A. and J. M. Anderson Mfg. Co., Boston, Mass., the associate concern in this country being the Colton Electrical Equipment Co., Ltd., 25 Moor Lane, Cranham, Upminster, Essex.

Scialytic lighting units, makers of? S.B.C.—General Electric Co., Ltd., Magnet Hse, Kingsway, W.C.2; Technical Lights and Equipment Ltd., 9 Bentinck Mews, W.1; G. Davidson and Co., Ltd., 118 Newgate St, E.C.1; Mann Egerton and Co., 14 Berkeley St, W.1; Kelvin and Hughes Ltd., 2 Caxton St, S.W.1.

"Finlayson's" lacing twine, makers of? A.W.C.—Finlayson, Bousfield and Co., Ltd., Johnstone, Scotland.

. . . and Overseas

Details of items marked may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

27 Apr.—New Zealand. Supply of 600 valves, type 813, for Post and Telegraph Dept., Wellington. (Quot. No. P.S.S. 164). B.o.T. (Ref.: ESB 8405/54).*

4 May—U.S.A. Supply of auto transformers for Watertown substation on Missouri River Basin project for U.S. Bureau of Reclamation, Denver, Colorado. Tender No. 4141. B.o.T. (Ref.: ESB 8615/54).*

10 May—Australia. Supply, manufacture of 132 kV power line carrier protective relay equipment for 50 c/s transmission lines. Tender No. 247. Electricity Commission of N.S.W. B.o.T. (Ref.: ESB 7369/54).*

10 May—India. Supply of three 5 MVA, to 10 MVA and two 15 MVA 132-33 kV 3-phase power transformers for substations of Damodar Valley Corporation. Specif. No. ED-712-2. Corporation's Chief Electrical Engineer, Anderson Hse, Calcutta 27, at Rs 50 a copy.

12 May—Australia. Tenders (No. 613) invited for supply, erection, etc., of two boilers for Mount Gambier steam power station. Secretary, Electricity Trust of S. Australia, Adelaide. B.o.T. (Ref.: ESB 8124/54).*

29 May—Portuguese W. Africa. Supply and erection of five silos in Angola and equipment for upkeep and loading of railway wagons, and electric generators to operate the plant. Maize Guild of Overseas Territories. B.o.T. (Ref.: ESB 8129/54).*

May—Iraq. Directorate-General of Municipalities, Baghdad, invite tenders for supply of one 100 kW d.c. generating set at Kifri, closing day 10 May; and also for two 500 kW alternator sets at Saadiya, and one 50 kW and one 25 kW alternator set at Mahaweel, closing date 13 May. Deposit I.D. 500s. B.o.T. (Ref.: ESB 8223/54).*

29 June—Uruguay. Tenders (3985/54) invited for supply of steam generating units corresponding to "Battle and Ordonez" thermo-electric station (second unit of 50 MW) with all equipment for generating 225 tons/hr of superheated steam. Administracion General de los Usinas Electricas y los Telefonos del Estado. B.o.T. (Ref.: ESB 7735/54).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 6 April

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	235½	−¾	280
,, (3 months)	227⅝	−¾	—
LEAD, refined pig, min. 99·97% purity (cash)	93½	+1½	86⅝
,, (3 months)	91½	+1⅝	83⅝
TIN, refined, min. 99·75% purity (settlement)	760	+30	832½
,, (3 months)	721	+16	807½
ALUMINIUM, ingots 99-99·5%	156	—	161
ZINC, virgin, min. 98% purity (cash)	79⅜	+⅜	74⅛
,, (3 months)	78⅛	+⅛	74⅛
RUBBER No. 1, RSS. spot (per lb)	17⅜d.	+⅜d.	19⅜d.
,, c.i.f. basis, ports. June (per lb)	17 1/16d.	+1/16d.	19½d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52	—	51½
Mild Steel Tape (0·014 in.)	40½	—	40

Contracts Placed

B.E.A. High pressure pipework at Bankside, C. A. Parsons and Co., Ltd.; 132 kV and multicore cables at Marchwood, Pirelli-General Cable Works, Ltd. and 415 V motor contactor gear at same, Brookhirst Switchgear, Ltd.; Two 830,000 lb/hr boilers at Castle Donington, Babcock and Wilcox, Ltd.; three cooling towers at Hams Hall C, Film Cooling Towers (1925), Ltd.; Cooling tower at Bold A, Film Cooling Towers (1925), Ltd.; two booster and two boiler feed pumps at Ferrybridge B, The Harland Engineering Co., Ltd.; high and low pressure pipework at Keadby, C. A. Parsons and Co., Ltd.; circulating water pumps, pipework and valves at Wakefield, W. H. Allen Sons and Co., Ltd.; two 36 MVA generator transformers at Barony, General Electric Co., Ltd.; five boiler feed pumps at Dalmarnock, G. and J. Weir, Ltd.; 132 kV 3,500 MVA switchgear at Kearsley, Metropolitan-Vickers Electrical Co., Ltd.; and two 30 MVA 132/11 kV transformers at Windscale, C. A. Parsons and Co., Ltd.

Croydon T.C. Restoration of street lighting in Purley Way, S.E. Electricity Board, £3,540.

London. Electrical installation at Annadale primary school, Greenwich, Electrical Contracting Co., £1,514.

Portsmouth T.C. Supply of 16,190 15 W coloured lamps for Sea Front Illuminations. Wall and Attwooll Ltd., £1,282.

Southend-on-Sea. Flashing beacons at pedestrian crossings, Bergo Ltd., £1,540.

Gazette Announcements

COMPANIES ACTS

Fox and Co. (Childwall) Ltd. At the statutory meeting of creditors the statement of affairs disclosed liabilities £7,311, of which £5,446 was due to trade creditors; £864 to the Bank; and £1,000 to Mr R. J. Foss, a director. Assets estimated to produce £1,383 and after allowing £431 for preferential claims, there were net assets of £951, or a deficiency as regards creditors of £6,359. Issued share capital was shown at £1,000 and, so far as shareholders were concerned, there was a total deficiency of £7,359. Mr R. J. Foss stated he would withdraw his claim of £1,000; discharge in full Bank overdraft and make no claim in liquidation; and also augment assets by payment of £150 to liquidator. Creditors unanimously passed a resolution confirming voluntary liquidation with Mr S. Oliver Henry, of Parkin S. Booth and Co., 5 Rumford Place, Chapel St, Liverpool, as liquidator. Committee of inspection also appointed.

Premier Electric Welding Co. (Mersey) Ltd. Meeting of members at 1 Tithe Barn St, Liverpool, on 2 May at 9.30.

BANKRUPTCY ACTS

Receiving Orders

Liverpool. Herbert Pryor, trading as W. Pryor, electronic engineer, at 36 Low Hill, Liverpool 6. Date of receiving order, 22 Mar.

Bristol. Anthony G. Dunn, electrician and car dealer trading at the Bungalow, Water Lane, and 3 Glen View Rd, Bristol. Date of receiving order, 29 Mar.

Appointment of Trustees

London. Count Jerzy Piotr Zaluski (deceased), electronic engineer, of 8 Palace Gardens Mansions, Kensington, W.8. Trustee is R. L. Davis, C.A., 58 Theobalds Rd, W.C.1.

Chester. William J. Standing, electrician, trading at 7 Brook St, Chester. Trustee is S. O. Henry, acc., 5 Rumford Place, Chapel St, Liverpool.

Release of Trustees

Barrow-in-Furness. Tom Sarginson, electrician trading at Market Hall, Ulverston. Trustee was D. Atkinson, Official Receiver, 14 Lowther St, Carlisle.

York. William P. Wann, trading as Electricity Service in Grape Lane, York. Trustee was W. H. Meredith, Official Receiver, 29 East Par, Leeds.

TRADE NOTES

Change of Address. As from 10 April, the offices of the B.E.A. London Divisional Accountant's staff at Clifton Hse, Euston Rd, N.W.1, will be transferred to Generation Hse, Gt. Portland St, W.1. Telephone: Museum 6844.

The Northern area organisation of Birlec, Ltd., has moved from 63 Arundel St, Sheffield, to new offices at 317 Glossop Rd, Sheffield 10; Telephone: Sheffield 63258-9.

Extension. Bylock Electric Ltd. have won their appeal to the Minister of Housing and Local Government for permission to erect two-storey factory premises on a site adjoining their present factory in Ponders End.

New Factory. Electrolux Ltd. officially opened a new factory at Santry, Co. Dublin, last week. Having an area of 10,000 sq ft, the factory will produce about 600 vacuum cleaners a month.

Manufacturing Licence. Ardente Acoustic Laboratories Ltd., have granted a sale and exclusive licence to manufacture and sell their range of intercom, loud-hailer, marine "talk back" systems, marine and general public address equipment to Easco Electrical Ltd., 6/8 Brighton Terrace, Brixton, S.W.9. These arrangements have no bearing on "Ardente" hearing aids which are handled from Ardente's head office at 21/23 Wigmore St, W.1.

New Phone No. The telephone number of W. T. Henley's Telegraph Works Co., at 38-39 St. Mary St, Southampton, has been changed to Southampton 23156.

BUSINESS PROSPECTS

Home

Aberdeen. J. R. Riddell, 13 Bridge St, is quantity surveyor for £88,000 building proposed by Strathdee Ltd.

Basford (Notts) R.D.C. Erection of 62 houses and 22 bungalows at Selston; 22 houses and four bungalows at Annesley; 22 houses and five bungalows at Sutton Bonington; 10 bungalows at Ruddington and eight at Brinsley. Council's Housing Architect, J. J. G. Ellis, Rock Hse, Stockhill Lane.

Bath. National Trust to rebuild Bath Assembly Rooms. Cost estimated at £300,000. Plans by Prof A. E. Richardson, 31 Old Burlington St, London, W.1.

Bicester U.D.C. Erection of houses and flats, being first part of 100 dwellings on new site. Lesslie K. Watson, 6 Gray's Inn Sq, London, W.C.1.

Birkenhead. Application made for immediate start on Rock Ferry high school extensions to cost about £31,393.

Bolton T.C. Erection of teaching block B at Gt. Lever secondary school. Borough Engineer and Surveyor, Town Hall.

Brighton T.C. Factory to be built on Lower Bevendean light industrial estate for Brighton Sheet Metal Works Ltd. Also, erection of 126 flats on Hollingbury estate.

Carlisle. Plans being prepared by W. C. Mangan, 2 Ribblesdale Pl, Preston, for R.C. church in Edgehill Rd.

Crayford U.D.C. Erection of block of 31 flats in Erith Rd, Barnehurst. Engineer and Surveyor, Town Hall, Crayford.

Croydon. Permission sought to include a number of schools in next year's building programme. They include £305,660 Fairfield Technical College (stage 2), the £147,250 Ingram secondary girls' school, and Croydon secondary technical school.

Darlington R.D.C. Plans prepared by Hulton and Hulton, 24 Southend Ave, for 12 houses at Aycliffe, 10 at Middleton-St. George, and eight at Whessoe.

Deptford B.C. Construction of civil defence control centre at New Cross. Borough Engineer and Surveyor, Town Hall, S.E.14.

Doncaster T.C. It is proposed to erect Technical High School for boys at estimated cost of £140,000.

Dundee T.C. Plans to be prepared for illuminations at Broughty Ferry.

Falmouth T.C. Tenders to be invited for installation of electricity in 245 council houses. Estimated cost £5,250.

Galway. Erection of 253 houses and shopping centre on Merview estate. P. J. Sheehan, consulting architect and engineer, 47 O'Connell St, Limerick.

Gravesend (Kent). British Railways planning construction of new station at Gravesend Central.

Guildford. Plans submitted for factory at Station Meadows for Keefe and Lewis Ltd., of Bridge St.

Hailsham (Sussex). Plans submitted for erection of neurosis unit at Hellingly Hospital. Estimated cost, £114,000.

Ilford. O'Neill and Fordham, 210 Springfield Rd, Chelmsford, is architect for church, a hall and presbytery in Padnall Rd. Also T.C. has scheme in hand for erection of public baths at Barkingside. Estimated cost £625,000.

N. Ireland. Construction of 108 houses in Crumlin Rd. Antrim. N.I. Housing Trust, 12 Hope St, Belfast.

Kensington. L.C.C. scheme in hand for erection of secondary school at Holland Park at estimated cost of £617,135.

Kirkcaldy. Dean of Guild Court has granted warrant for erection of high school at Dunniker Park. Estimated cost £400,000.

Liverpool. T.C. considering leasing land on Kirkby industrial estate to Waygood-Otis Ltd., for erection of works and offices; and land in Greek St to J. Davies and Co. (Liverpool) Ltd., for erection of block of offices.

London. Metropolitan Water Board proposes to install three electrically-driven pumps with control gear and laying power supply, at Rock Hill, Sydenham. Estimated cost is £10,200.

Lowestoft. First instalment to be started shortly of Bally's Shoe Factories (Norwich) Ltd. Architects are Buckingham and Berry, 10 Thorpe Rd, Norwich.

Merthyr Tydfil T.C. Construction of 181 houses at Gurnos and 20 at Troedyrhiw. Borough Engineer and Surveyor, Town Hall.

Milford Haven U.D.C. Plans approved for erection of block comprising 10 shops, maisonnettes and flats in Wellington Rd.

Musselburgh T.C. Erection of block of 27 flats in New St. Burgh Surveyor, Municipal Offices, High St.

Newcastle-on-Tyne T.C. Erection of 12 flats on Tarset St site and nine on Buckingham St site. City Architect, 18 Cloth Market.

Norwich. Architects for Fletcher and Son Ltd.'s proposed factory on Harford industrial estate are J. O. Bond and Son, St. Faith's Hse, Mountergate, Norwich.

Prudhoe U.D.C. Erection of 105 houses at West Wylam. Architect, J. M. Angus, 21 Lovaine Pl, Newcastle.

Reading T.C. Chr. Hansen's Laboratory Ltd., propose to build factory on Manor Farm factory site. Architects are Sainsbury and Chamberlain, 14 Cross St, Reading.

Scotland. Western Hospital Board propose extensions at Bellshill and R.S.N.I. Hospitals. Costs estimated at £600,000 and £304,925 respectively. Also nurses' home costing £57,200 to be built at Stirling Royal Infirmary.

Southwark B.C. Plan received for factory off Lytham St for F. C. Savage and Son Ltd., 4-6 Queen's Row, S.E.7.

Southwell (Notts) R.D.C. Construction of 32 houses, 22 bungalows and blocks of flats at Rainworth. S. Cooper, surveyor, Council Offices, Westgate, Southwell.

Stamford (Lincs) T.C. Plans prepared by F. J. Lenton and Partners, architects, 16 Broad St, for 95 houses on Drift Rd estate.

Stoke Newington B.C. Schemes approved for erection of 72 dwellings on Manor Rd site, and 52 on Bethune Rd site.

Tynemouth. Work to begin next year on Lynn Rd R.C. secondary school, and Argyle Terrace technical school.

Walthamstow. Sketch plans approved for first stage of N. Walthamstow Technical School to cost about £217,938.

Whitefield (Lancs.). Essrow Cinemas Ltd. propose to rebuild the Mayfair Cinema, Besses o' th' Barn.

Worksop T.C. Erection of 50 bungalows in Valley Rd area. Borough Engineer, Park Hse, Park St.

Overseas

Australia. Mr Bert Martin, of B. Martin Pty. Ltd., 35 Charlotte St, Brisbane, is to visit this country shortly and wishes to contact manufacturers who require representation in Queensland of domestic electrical appliances, motors and accessories, sewing machine motors. Contact should be made through B.o.T.'s Export Services Branch quoting ref. ESB 6780/54.

U.S.A. Charles Vermilye Co. of 1010 South Robertson Boulevard, Los Angeles 35, would like to import electronic components from U.K. Main interest is in capacitors, resistors, transistors, diodes, alternators, potentiometers, relays, switches and testing devices.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

W. M. Baldwin and Co., Ltd., 26 Poplar Rd, Solihull, Warwickshire. Electricians, radio, television and mechanical engineers, etc. Nom. cap.: £5,000. Dirs.: W. Baldwin, Mrs E. A. D. Baldwin and A. Smith.

Deajac Products Ltd., Drayton Hse, Gordon St, W.C.1. General, electrical and mechanical engineers, etc. Nom. cap.: £1,000. Dirs.: F. V. Gunn, D. Jackson, J. J. Knight and S. F. Smith.

L. A. Drew and Co., Ltd., Courtland Chambers, Station Lane, Hornchurch, Essex. Mechanical designers, designers for mechanical engineers, electrical engineers, etc. Nom. cap.: £1,000. Permanent dirs.: L. A. Drew, K. Saunders and E. Krzywda.

A. E. Hutchings Ltd. To take over business of electrical engineer and contractor carried on at Grenville Works, Kingsley Rd, Bideford, Devon, as A. E. Hutchings and Co., electrical, radio, television and general engineers. Nom. cap.: £4,000. Permt. dirs.: A. E. Hutchings, Betty F. Hutchings and M. T. Hutchings.

International Combustion Products Ltd., 19 Woburn Place, W.C.1. Manufacturers of and dealers in plant, machinery and engineering products, etc. Nom. cap.: £100. Dirs.: to be appointed by subscribers. Subs.: W. H. Barnes and R. Smith, Winchester Hse, Old Broad St, E.C.2.

International Combustion (Export) Ltd., 19 Woburn Place, W.C.1. Manufacturers of and dealers in plant, machinery and engineering products, etc. Nom. cap.: £100. Dirs.: to be appointed by subscribers. Subs.: W. H. Barnes and E. G. Gosling, Winchester Hse, Old Broad St, E.C.2.

Plant Electric Ltd. Electrical wholesalers, engineers and manufacturers, etc. Nom. cap.: £100. Dirs.: to be appointed by subscribers. Subs.: Jean Herbert and Claire Moore, 128 Albany St, N.W.1.

D. V. Stone and Co., Ltd. Electrical and general engineers, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subscribers. Subs.: Agnes M. Hughes and L. Gordon, 76 New Cavendish St, W.

MEETINGS TO NOTE

THURSDAY, 8 APR.

I.E.E. (London Supply).—Section dinner-dance at Cafe Royal, 7 p.m.

I.E.E. (N. Scotland).—Annual meeting. Chairman's address at C.H.A. Collyns.

E.P.E.A. (Merseyside). — Discussion on "Power Station Operating Efficiency." D. F. Grant. Elect. Offices, Whitechapel, Liverpool, 7 p.m.

Soc. OF INSTRUMENT TECHNOLOGY.—Discussion on "Rationalisation of Units for Electrically Operated Servos." Manson Hse, Portland Place, W.1, 7 p.m.

I.E.E. (London Students).—"Machines, Animals and Information," B. Z. de Ferranti. R.E.M.E. Training Centre, Hazebrouck Barracks, Arborfield.

INSTN. OF WORKS MANAGERS.—"Factory Safety and Works' Managers' Responsibilities," Sir George P. Barnett. Waldorf Hotel, W.C.2, 7 p.m.

FRIDAY, 9 APR.

I.E.E. (Southern).—Discussion on "Electric Space Heating," K. Orchard, Technical College, Weymouth, 6.30 p.m.

A.S.E.E. (Stoke and Crewe).—"Power Factor Correction of Industrial Loads," Royal Hotel, Crewe, 7.30 p.m.

MONDAY, 12 APR.

I.E.E. (London).—Discussion on "Safety Measures for Radio and TV Equipment," E. P. Wethey. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Eastern).—Annual meeting and conversazione. Station Hotel, 6.15 p.m.

I.E.E. (N. Midland).—Faraday lecture on "Electro-Heat and Prosperity," O. W. Humphreys. Town Hall, Leeds, 7 p.m.

I.E.S. (Sheffield).—President's address and annual meeting. The University, Western Bank, 6.30 p.m.

BIRMINGHAM ELECTRIC CLUB.—"Newer Insulating Materials," G. Tolley.

IPSWICH ELECTRICAL ASSOC.—"Air Compressors," S. Goymour. Electric Hse, 7.30 p.m.

LEICESTER ELECTRICAL SOC.—"Application of Magnetic Devices," J. E. Apted. Elect. Offices, Charles St, 7 p.m.

TUESDAY, 13 APR.

I.E.E. (N. Midland Utilisation).—"Fluorescent Discharge—Tube Circuits and Operating Problems," J. Cates. Elect. Offices, 1 Whitehall Rd, Leeds, 6.30 p.m.

I.E.E. (N.W. Supply).—"Design Features of Semi-Outdoor Power Station at Ince," F. H. S. Brown. Engineers' Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (N. Ireland).—"Special Effects for TV Studio Productions," A. M. Spooner and T. Worswick. Presbyterian Hostel, Howard St, Belfast, 6.15 p.m.

I.E.S. (London).—"Illuminants for Colour Reproduction and Printing," H. M. Cartwright. School of Hygiene, Keppel St, W.C.1, 6 p.m.

A.S.E.E. (London).—"Battery Operated Vehicles," E. G. Barton.

I.E.E. (London Students). — President's address by H. Bishop. Savoy Place, W.C.2, 6.30 p.m.

NEWPORT ELECTRIC CLUB. — "C.A.P. Cables." H. S. Pilling. Tredegar Arms Hotel, 7 p.m.

WEDNESDAY, 14 APR.

I.E.E. (Sheffield). — Faraday lecture: "Electro-Heat and Prosperity," O. W. Humphreys. City Hall, 7.30 p.m.

I.E.E. (N. Lancs).—"Electricity in Wool Textile Industry," A. J. Francis and T. H. Cart. Elect. Offices, Darwen St, Blackburn, 7.15 p.m.

BRIT. INSTN. OF RADIO ENGINEERS (N. Eastern).—"Electro-encephalography," Prof Alexander Kennedy and J. W. Osselton. Neville Hall, Westgate Rd, Newcastle, 6 p.m.

THURSDAY, 15 APR.

I.E.S. (Glos. and Cheltenham).—Annual meeting at G.E.C. Ltd., 2 St. Aldate St, Gloucester, 6.30 p.m.

INCORP. PLANT ENGRS. (Blackburn).—"Thermal Insulation in Medium Temperature Range," C. Jolley. Grosvenor Hotel, 7.30 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Tiltray. 724,750. Class 9. Relays and switches. Besson and Robinson Ltd., 3 Government Bldgs, Kidbrooke Park Rd, S.E.3.

Crab in tree design. 724,996. Electrical apparatus in Class 9. J. A. Crabtree and Co., Ltd., Lincoln Rd, Walsall.

Durium. 726,772. Class 9. Gramophones, radio-gramophones etc. Decca Record Co., Ltd., 1/3 Brixton Rd, S.E.9.

Plastiseal. 726,806. Class 9. Condensers. Telegraph Condenser Co., Ltd., Wales Farm Rd, W.3.

Speedwell. 726,855. Class 9. Motor car batteries. Speedwell Batteries (London) Ltd., 3a Mardale St, Goldhawk Rd, W.12.

Colour Glance. 725,518. Class 11. Installations and apparatus for cooking and heating. Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.

Magnalite. 727,010. Class 11. Lamps for road vehicles. James Neale and Sons Ltd., 68 Graham St, Birmingham 1.

Krismalex. 717,902. Class 17. Specification includes screens, insulating materials etc. Mawson Taylor Ltd., Pioneer Mills, Radcliffe, Manchester.

Penrex. 725,982. Class 17. Washers and electric insulators, all made of plastics. L. and P. Developments Ltd., Hawthorn Grove, Penge, S.E.20.

Minifon. With design, 725.866. Class 9. Apparatus and instruments for recording and reproducing sound by means of magnetic wires or tapes. Minifon (Gt. Britain) Ltd., 19 Gt. Winchester St, E.C.2.

Creda Star. 726,933. Class 11. Cooking stoves. Simplex Electric Co., Ltd., Broadwell, Oldbury near Birmingham.

Blendolite. 727,180 and **Edilux.** 727,181. All goods in Class 11. Edison Swan Electric Co., Ltd., 155 Charing Cross Rd, W.C.2.

Associated Electrical Industries

RECORD PRODUCTION

Sir George Bailey's Review of the Year

THE 54th annual general meeting of Associated Electrical Industries Limited was held on 31 Mar. in London.

Sir George E. Bailey, C.B.E., the Chairman, in the course of his speech, said: During 1953 your company once again established a record rate of production. Shipments invoiced both home and abroad totalled £86·1 million, compared with £76 million for 1952, an increase of 13 per cent.

Your Board considered it essential to reduce the ratio of stocks and work in progress to turnover. I am pleased to say that we have achieved some success, having increased our shipments by £10·1 million without any significant increase in actual inventory. More remains to be done. It is only by constant vigilance and careful balancing of many factors that this ratio can be kept under control without impairing the output capacity of the factories and service to our customers.

Total orders received during the year show a reduction compared with the previous year. This, together with our increased production, has naturally led to some reduction in the volume of orders in hand. However, it is gratifying to note that these still amount to the comforting total of £124 million with deliveries extending into 1957. This reduction carries with it some advantage in that it enables us to offer shorter deliveries for some products and so to increase our competitive advantage in those markets where deliveries are all important.

The Group continues to play an important part in providing new generating plant for the British Electricity Authority. During 1953 we commissioned an aggregate capacity of turbo generators on the B.E.A. system of more than 750,000 kW. The Metropolitan-Vickers Company's share of this total, over 550,000 kW, constituted a record for that company. Companies in the group have also received large and valuable orders from the B.E.A. for switchgear.

EXPORTS

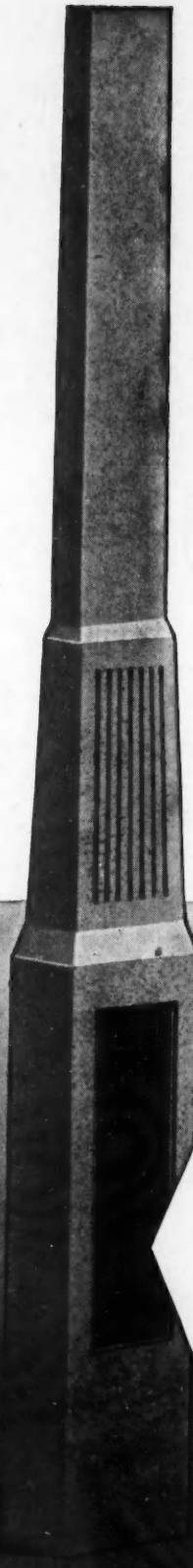
Your Group continues to make an impressive contribution to the country's export trade. During 1953 our shipments abroad exceeded those of the previous year by 14 per cent and constituted a record in the history of the Group.

You will have read in the Press about the future use of atomic energy in generating electric power. These developments so far envisaged only the generation of heat for the raising of steam and will, therefore, still require turbines, alternators and ancillary plant for the generation of electric power. Naturally we are watching these developments alertly and our research and design engineers are ready to take an active part in the solution of the many problems associated with the utilisation of this form of energy.

I feel it necessary to emphasise again that the desperate measures being taken by our foreign competitors, coupled with the rising prices in this country, make it essential to redouble our efforts to reduce costs if we are to maintain our position. It is not sufficiently appreciated that since the war we have moved from a position of having no competition from German and Japanese manufacturers to one where they are increasing their engineering exports at a rapid rate. Most of their factories have been rebuilt on modern lines and fitted with first-class tools and equipment.

Stockholders will be interested to know that their Board views the future with sufficient optimism to justify embarking upon a further long-term expansion plan for the manufacture of heavy electrical plant and steam turbines for both the M-V. and B.T.H. Companies. Also the Edison Swan and Ferguson Pailin Companies are expanding their facilities in the television component and switchgear fields.

The report was adopted.



HENLEY

IRONCLAD SERVICE FUSES

DOUBLE-POLE

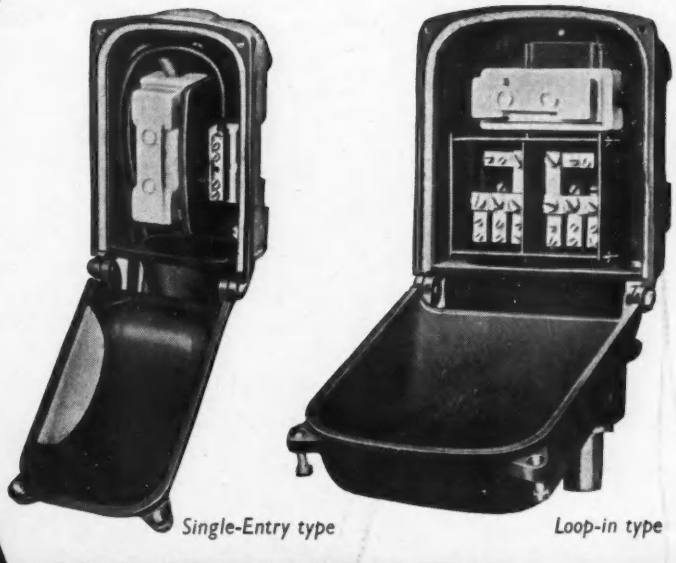
for use in lighting columns

These HENLEY Ironclad Service Fuses are designed specially for use in columns for outdoor lighting installations. Both are fitted with a fuse and neutral and suitable for maximum working current of 15 amp. The fuse can be supplied suitable for cartridge fuse-links or, alternatively, for wire fuse-elements.

STREET LIGHTING · FACTORY YARDS
CAR PARKS · RACETRACKS · FAIR GROUNDS
EXHIBITIONS · SPORTS ARENAS · FLOODLIGHTING

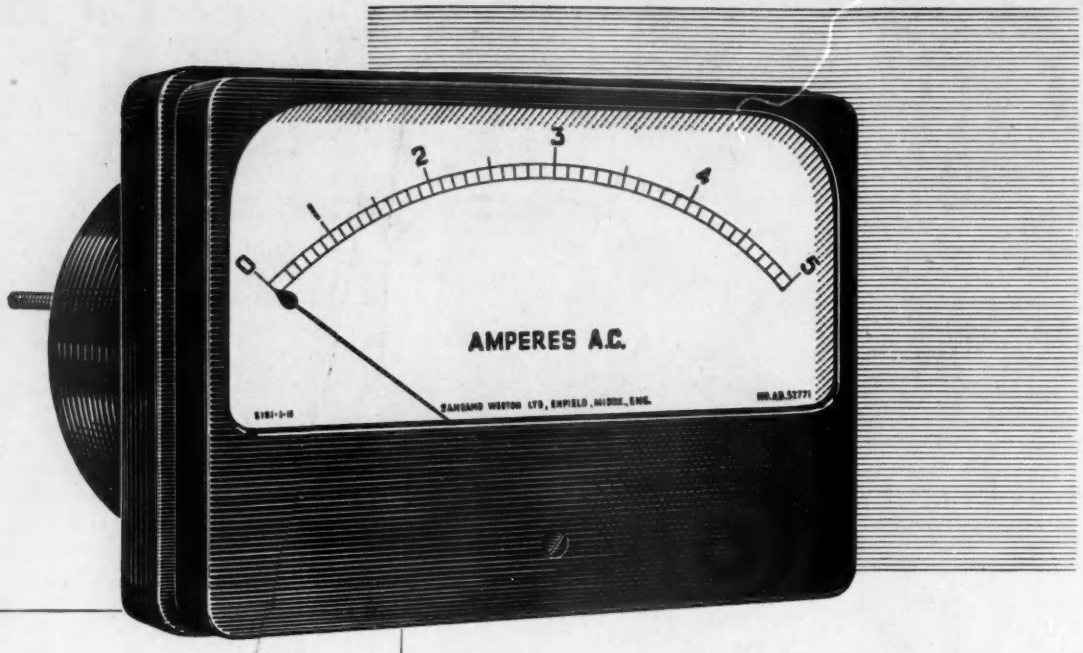
Compact · Robust

Write for Folder 49/A



Single-Entry type *Loop-in type*

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD. 51-53 HATTON GARDEN, LONDON, E.C.1



WESTON ELECTRICAL INSTRUMENTS INCLUDE:–

LABORATORY STANDARDS

SUB STANDARDS

FIRST GRADE PORTABLE INSTRUMENTS

ROUND, RECTANGULAR AND EDGEWISE SWITCHBOARD AND PANEL INSTRUMENTS

PORTABLE TEST SETS

RELAYS

AIRCRAFT INSTRUMENTS

THE WESTON RANGE OF RECTANGULAR INSTRUMENTS

These instruments, giving the advantage of long, easily read scales, are designed to harmonize with rectangular panels and are offered in a variety of types and scale ranges.

Supplied as D.C. moving coil, A.C. rectifier and H.F. thermocouple types; also A.C./D.C. moving iron types.

Four sizes are available with scale lengths of 2·5″, 3·2″, 4·2″ and 6·25″.

Front of panel or back of panel mounting may be adopted as desired and if the former method is used, there is complete interchangeability with existing round models.

The 3·2″ and 4·2″ scale instruments are available with either illuminated or non-illuminated dials; the 2·5″ and 6·25″ scale instruments being available only with non-illuminated dials.

WESTON

Measuring Instruments

SANGAMO WESTON LIMITED

ENFIELD · MIDDLESEX

Tel: Enfield 3434 (6 lines) & 1242 (6 lines) Grams: Sanweat, Enfield

Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 41151

Branches: London, CHAncery 4971 · Glasgow, Central 6208 · Manchester, Central 7904 · Newcastle-on-Tyne, Newcastle 26867 · Leeds, Leeds 30867 · Liverpool, Central 0230 · Wolverhampton, Wolverhampton 21912 Nottingham, Nottingham 42403 · Bristol, Bristol 21781 · Southampton, Soton 3328 · Brighton, Brighton 28497

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

BOROUGH OF GOOLE
Electric Street Lighting

THE Corporation invite tenders for the supply only of the following equipment: Concrete and Steel Columns, Conversion Units, Lanterns and Auxiliary Gear, Flashing Beacons.

Particulars of requirements and form of tender may be obtained on application to Thos. Waterfall, M.I.MUN.E., Borough Surveyor and Water Engineer, Municipal Offices, Goole.

Tenders in plain sealed envelopes endorsed "Street Lighting" to reach me by 26 Apl., 1954.

K. H. CHORLTON,
Town Clerk.

Municipal Offices,
Goole.
29 Mar., 1954. (H 361)

COUNTY BOROUGH OF SWANSEA
New Fire Station, Grove Place, Swansea

TENDERS FOR ELECTRICAL INSTALLATION

FIRMS wishing to Tender for the Electrical Installation at the New Fire Station to be erected at Grove Place, Swansea, are invited to submit their applications to the Borough Architect, The Guildhall, Swansea, on or before Wednesday, 28 Apr., 1954.

Plans, Specifications and Conditions of Contract can be obtained on application and deposit of £2, provided the applicant gives satisfactory evidence of having previously carried out work of a similar character.

The deposit will be refunded after delivery of a bona fide Tender (which is not subsequently withdrawn) and the return of all documents.

No guarantee is given that the lowest or any other Tender will be accepted.

T. B. BOWEN,
Town Clerk.

The Guildhall,
Swansea. (H 381)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, *or a woman aged* 18-59; *unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provision of the Notification of Vacancies Order,* 1952.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS are invited for Hydro-Electric TRAINEE ASSISTANT SHIFT CHARGE ENGINEERS at Fasnakyle Power Station. Salary £507 (N.J.B. Class F, Grade 12) during period of training.

Superannuation Scheme applicable. Applicants should possess B.O.T.—H.N.C. or similar qualifications.

Applications should be received by 30 Apr., 1954, stating age, qualifications and experience, addressed to: Generation Engineer, Fasnakyle Power Station, Cannich, Inverness-shire. (H 392)

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER (MAINTENANCE AND OPERATION)

ALDERSHOT District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 5, Column 1 (£791 per annum). N.J.B. Conditions of Service.

Applicants, who must possess suitable technical qualifications, should have had experience of the operation and maintenance of switchgear, transformers and cables up to and including 33 kV. The successful applicant will be required to assist the District Engineer with high and low voltage networks in this connection and deputise for him in his absence. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed not later than 24 Apr., 1954.

ASSISTANT ENGINEER (MAINTENANCE)

Reading District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 11, Column 1 (£573 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the operation and maintenance of H.V. and L.V. distribution mains and substations, and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him in envelopes suitably endorsed, not later than 24 Apr., 1954.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible. (H 395)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT required in the Warrington District of the Board's No. 2 Sub-Area. Salary within the range £548/£565 per annum (N.J.B. F.11).

Applicants should have had a sound technical training and, preferably, possess the qualifications necessary to enable them to become Chartered Electrical Engineers. Duties include estimating for contracting work and advising consumers on electricity supply matters and appliances.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, near Northwich, Cheshire. Closing date: 20 Apr., 1954. (H 367)

DRAWING OFFICE STAFF
British Electricity Authority, Headquarters

BANKSIDE, London, require:
(a) DRAUGHTSMAN (£458/£595) and a SENIOR DRAUGHTSMAN (£595/£705) for Building and Civil Engineering Works.
(b) DRAUGHTSMAN (£458/£595) with experience in Power Station Plant Layout.
(c) TRACER (female), £320 at age 21, thereafter to a maximum of £425.

All salaries quoted include London Allowance. Forms from D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London, W.1. Quote reference ET/474. (H 382)

UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment on the permanent staff:

CABLE JOINTER with experience in the laying and jointing of underground cables of all types on system voltages up to and including 11 kV. Single man preferred. Starting salary according to experience in the scale of £783 per annum rising to £1,053 per annum, including a variable cost of living allowance which is at present 35%.

Free, partly furnished accommodation is provided. Free medical and dental treatment Three-year contract in the first instance with free passages to and from Uganda up to a maximum of three adult fares. Vacation leave on full pay.

Uganda has a pleasant and healthy climate, while taxation and cost of living are not high.

Application forms and further information may be obtained from the Board's London Office at 27 Regent St, London, S.W.1. Applications to reach London Office by 28 Apr. (H 313)

BRITISH ELECTRICITY AUTHORITY
North Western Division

VACANCY No. 46/54: SHIFT CHARGE ENGINEER, Darwen Generating Station, Darwen, Lancs. Salary £493/£537 (A.7).

Vacancy No. 48/54: ASSISTANT SHIFT CHARGE ENGINEER, Agecroft H.P. Generating Station, Nr. Manchester. Salary £644/£667 (G.9).

Vacancy No. 49/54: STATION SHIFT CONTROL ENGINEER, Padiham Generating Station, Nr. Burnley. Salary £555/£569 (E.10)

Vacancy No. 50/54: SHIFT CHARGE ENGINEER, Kearsley Generating Station, Nr. Manchester. Salary £869/£907 (K.7).

Apply, quoting Vacancy No. to Establishments Officer, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 17 Apr. (H 369)

BRITISH ELECTRICITY AUTHORITY
Yorkshire Division

REQUIRE an ENGINEERING DRAUGHTSMAN (Civil) in the Generation Construction Department, Sheffield. Salary £433/£567 per annum. Grade 6, Schedule D, National Joint Board Agreement.

Candidates should have Drawing Office experience in at least one of the following:
(a) Reinforced concrete structures and foundations.
(b) Structural steelwork.
(c) General building operation associated with power stations and industrial works.

Application forms obtainable from the Divisional Secretary (Establishments) British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Rd, Leeds, 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(H 390)

BRITISH ELECTRICITY AUTHORITY
South West Scotland Division

MAINTENANCE ENGINEERS (ELECTRICAL) CLYDE'S MILL, KILMARNOCK AND YOKER GENERATING STATIONS

APPLICATIONS are invited for the positions of Maintenance Engineers (Electrical) at Clyde's Mill, Kilmarnock and Yoker Generating Stations.

Applicants should have received a good technical education and have extensive experience of electrical equipment and the organisation of maintenance in a Power Station. The salary will be Grade 6 of Schedule "A" of the N.J.B. Agreement Class "J" in the case of Clyde's Mill and Class "F" in the case of Kilmarnock and Yoker.

Applications on Form AE.6, which may be obtained from Divisional Headquarters or any Divisional Office of the Authority, should be forwarded to 168 Broomhill Drive, Glasgow, W.1, before 21 Apr., 1954. (H 393)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

JUNIOR ENGINEER (CONTROL ROOM)—FULHAM GENERATING STATION
Vacancy No. 54/244

Candidates should have had sound training in Electrical or Mechanical Engineering. Salary—Class L, Grade 16=£574. 7s. p.a.

STATION SHIFT CONTROL ENGINEER—TAYLORS LANE CENERATING STATION
Vacancy No. 54/245

Experience in operational control of E.H.T. Switchgear, together with knowledge of D.C. and A.C. L.T. distribution and Rotary Convertors. Salary—Class F, Grade 10=£605. 17s. p.a.

STATION SHIFT CONTROL ENGINEER—WEST HAM GENERATING STATION
Vacancy No. 54/246

Sound technical training and practical experience in the control and operation of steam generating plant and main switchgear in modern Generating Station. Salary—Class H, Grade 10=£673. 1s. p.a.

JUNIOR ENGINEER (SHIFT) (CONTROL ROOM)—BARKING "A" & "B" GENERATING STATIONS
Vacancy No. 54/247.

Sound engineering training necessary, with generating station experience. Salary—Class M, Grade 17/3=£574. 7s. p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation Hse, Great Portland St, W.1, and be received within 14 days of this advertisement. (H 387)

GOVERNMENT OF KUWAIT

JUNIOR SHIFT ENGINEERS required for service with the Government of Kuwait, Persian Gulf. Their services are required for a new Steam Power Station and a Water Distillation Plant. They will be required to work on shift under the Shift Charge Engineers. Applicants must have had shift operating experience, with boiler and turbo alternator plant as well as control room experience, and no applicant will be considered unless he complies with the above requirements. The starting consolidated salary offered is at the rate of £1,500 per annum. Free furnished quarters and free medical attention are provided. The first year will be probationary and, subject to satisfactory service, this contract may be extended by another two years. Married accommodation cannot be promised under one year. Applications in the first instance, stating qualifications, training and experience, to be addressed to the Secretary, EWBANK AND PARTNERS LIMITED, Engineering Consultants, 10/11 Grosvenor Place, London, S.W.1. (H 323)

HER MAJESTY'S COLONIAL SERVICE

THE following vacancies exist in the Electrical Services Department in Nyasaland:

GENERATION ENGINEER
(CDE. 145/4/01) NYASALAND

Duties include maintenance and operation of steam power and diesel plant. Commencing pay (inclusive of allowances) of £1,458 per annum in a scale rising to £1,710 per annum to suitably qualified and experienced candidate.

Appointment will be on three years' probation for pensionable employment. Free passages, once each way each tour, to officer, his wife, and children up to the cost of one adult passage. Quarters, if available, are provided at low rent and leave is granted at the rate of 5 days for each month of service after a tour of two to three years.

Candidates, not over 40 years of age, should be Corporate Members of either the Institution of Electrical Engineers or the Institution of Mechanical Engineers, and should be familiar with the operation and maintenance of modern medium pressure steam power plant.

JUNIOR ELECTRICAL ENGINEER
(CDE. 145/4/01) NYASALAND

Duties include maintenance and operation

continued in next column

continued from previous column

of steam power and diesel plant. Salary scale £695/£1,245 per annum increasing to £1,515 per annum if officer appointed holds A.M.I.E.E., plus cost-of-living allowance of approximately 13%, the point of entry being determined by war service and experience.

Appointment will be on three years' probation for pensionable employment. Free passages, once each way each tour, will be granted to the officer, his wife, and children up to the cost of one adult passage. Quarters if available, are provided at low rent and leave is granted at the rate of five days for each month of service after a tour of two to three years.

Candidates between 23 and 27 years of age should have passed or be exempt from Sections A and B of the Associate Membership Examination of the Institution of Electrical Engineers and should have had experience in an electricity supply undertaking, with particular emphasis on distribution. Power station experience an advantage.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number shown against the post applied for. (H 355)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments:

Vacancy No. 31/54

SHIFT CHARGE ENGINEER at Tir John Power Station, Swansea. Salary H7, £772/£802 per annum.

Applicants should preferably have obtained H.N.C. and served a regular apprenticeship. Previous experience of operation in a modern power station essential.

Vacancy No. 32/54

ASSISTANT MAINTENANCE ENGINEER (Mechanical) at Uskmouth Power Station. Salary Class K, Grade 9, £766/£796 per annum.

Applicants should have obtained appropriate H.N.C. and had previous maintenance experience.

Applications forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Rd, Gabalfa, Cardiff, should be returned by 19 Apr., 1954. (H 388)

NORTH WESTERN GAS BOARD
North Cheshire Group

GROUP ELECTRICAL SUPERINTENDENT

APPLICATIONS are invited for the above pensionable appointment at a salary within Grade A.P.T.11 (£715/£840 per annum).

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers, or have passed Section A and B or be exempt therefrom.

Applicants should have experience in the operation and maintenance of 1,200 kW alternators, 6·6 kV, 3·3 kV and 440 kV distributions systems, electric motors and starters up to 500 h.p. at 3·3 kV, and the organisation of routine electrical maintenance.

Detailed applications, giving the names of two referees, should reach the General Manager, North Western Gas Board (North Cheshire Group), Great Portwood St, Stockport, within 14 days. (H 394)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

REQUIRE a CIVIL ENGINEER based at Divisional Headquarters, Nottingham.

Candidates should preferably possess a University Degree in Civil Engineering or equivalent and be Corporate Members of the Institution of Civil Engineers. They should have a comprehensive experience of the design and execution of all civil engineering works associated with large power stations, including foundations and structures in all the usual materials and layout of railway sidings. A knowledge of contract documents, specifications, preparation of Bills of Quantities and reporting on tenders is essential.

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The salary will be provisionally fixed at £1,500 per annum.

Applications stating age, present position and salary, and giving full details of qualifications and experience to D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London, W.1, by 24 Apr., 1954. Please quote reference AE.472. (H 371)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area

ROTHERHAM DISTRICT
DISTRICT ENGINEER

APPLICANTS should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications. They must be widely experienced in all branches of electricity distribution work covering Industrial, Urban and Rural Areas with underground and overhead systems.

Salary—N.J.B., Class H, Grade 3, £1,035/£1,081 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 22 Apr., 1954.

No. 6 (Hull) Sub-Area

HULL DISTRICT
GENERAL ASSISTANT ENGINEER
(COMMERCIAL)
(RURAL DEVELOPMENT)

Applicants should have had a sound practical training in electrical installation work, and have an up-to-date knowledge of the utilisation of electrical appliances on farms. The successful applicant will be required to negotiate with consumers requiring electricity supplies particularly in rural areas, and deal with estimates for installations, tariffs and sales development generally.

Candidates should have passed the Higher National Certificate in Electrical Engineering or hold similar qualifications.

Salary—N.J.B., Class H, Grade 11, £607/£628 per annum.

BRIDLINGTON DISTRICT — 1 POST
GOOLE DISTRICT — 1 POST
GENERAL ASSISTANT ENGINEER
(COMMERCIAL)
(RURAL DEVELOPMENT)

Applicants should have had a sound practical training in electrical installation work, and have an up-to-date knowledge of the utilisation of electrical appliances on farms. The successful applicant will be required to negotiate with consumers requiring electricity supplies particularly in rural areas, and deal with estimates for installations, tariffs and sales development generally.

Candidates should have passed the Higher National Certificate in Electrical Engineering or hold similar qualifications.

The successful applicants will be required to reside in the Bridlington or Goole District.

Salary—N.J.B., Class D, Grade 11, £500/£516 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 22 Apr., 1954.

No. 1 (Bradford) Sub-Area

OTLEY DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

Applicants should have passed the Graduateship Examination of the Institution of Electrical Engineers, or hold equivalent qualifications, and have experience in construction, operation and maintenance of high voltage systems, underground cables, overhead lines, substations and medium low voltage networks.

Candidates should be prepared to reside within the district and to undertake standby duties.

Salary—N.J.B., Class E, Grade 9, £587/£600 per annum.

Applications, stating full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 22 Apr., 1954. (H 370)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

GENERAL ASSISTANT DISTRICT ENGINEER
WORCESTER AND MALVERN DISTRICT
WORCESTER AND DISTRICT SUB-AREA

Experience necessary in all branches of Distribution Work including operation and maintenance of high and low voltage cables and overhead lines, substations, etc. Technical qualifications desirable. Salary £524/£540 per annum (N.J.B., Grade E.11). (The classification for the year 1953/54 is based on unit sales of approximately 96 millions.) Apply, in writing, within 14 days stating age, qualifications, experience, present salary and position to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

DEMONSTRATOR (FEMALE)
WEDNESBURY DISTRICT, SOUTH STAFFS AND NORTH WORCS SUB-AREA

Applicants must have had a good education and should have a certificate of a recognised Domestic Training College and/or the E.A.W. certificate. Duties include lecture demonstrations in Service Centres and on consumers' premises, and advising consumers on the selection and use of electrical appliances. Salary £400/£490 per annum (N.J.C., Grade 1). Apply, in writing, within 14 days, stating age, education, qualifications, training and experience to Mr T. G. Keeler, Sub-Area Manager (Ref. CW), Midlands Electricity Board, Toll End Rd, Tipton.

A. STEPHENS,
Secretary.
(H 372)

BRITISH ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for a post as:

SECOND ASSISTANT STATION CHEMIST
POOLE GENERATING STATION

Applicants should have had practical experience of fuel, water and oil testing appropriate to a modern generating station, and a knowledge of boiler chemistry for high steam pressures and temperatures will be an advantage. Preference will be given to candidates with H.N.C. in chemistry or equivalent qualifications.

Salary N.J.B. Class H. Grade 11. £607/£628.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 21 Apr., 1954. (H 389)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

ENGINEERING DRAUGHTSMEN
(CIVIL)
CONSTRUCTION DEPARTMENT
Vacancy No. 1/54

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings.

The salary will be in accordance with Grade 5 (£567/£671 per annum) or Grade 6 (£433/£567 per annum) of Schedule D of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN
(MECHANICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 2/54

Senior Draughtsmen are required in the Mechanical Section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

The salary will be in accordance with the National Joint Board Agreement, Grade 5 (£567/£671 per annum) and Grade 6 (£433/

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£567 per annum) of Schedule D according to experience.

ENGINEERING DRAUGHTSMEN
(ELECTRICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 3/54

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. Switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with the National Joint Board Agreement Grade 5 (£567/£671 per annum) and Grade 6 (£433/£567 per annum) of Schedule D according to experience.

CLERICAL ASSISTANT,
LANDS AND ESTATES SECTION,
SECRETARY'S OFFICE
Vacancy No. 43/54

Duties will include the preparation and upkeep of property registers and essential records and general estate management routine.

A knowledge of the law relating to Town and Country Planning and previous experience in an Estates Office is desirable.

The salary for the appointment will be within Grade 2 (£485/£545 per annum) of the National Joint Council Agreement.

The closing date for receipt of applications is 15 Apr., 1954.

ASSISTANT,
FINANCIAL SECTION,
SECRETARY'S OFFICE
Vacancy No. 44/54

Duties will include the collating of estimates in respect of capital and revenue expenditure, maintaining central records and forecasting supplementary requirements. Experience in a professional Accountant's office and a knowledge of the procedure relating to budgetary control is essential.

The salary for the appointment will be within Grade 3 (£545/£605 per annum) of the National Joint Council Agreement.

The closing date for receipt of applications is 15 Apr., 1954.

BOILER HOUSE SHIFT CHARGE ENGINEER,
LEICESTER POWER STATION
Vacancy No. 45/54

Applicants should have good experience in the efficient operation of large P.F. units and be technically qualified.

The salary for the appointment will be within Class H, Grade 9 (£680/£706 per annum) of the National Joint Board Agreement.

The closing date for receipt of applications is 15 Apr., 1954.

DRAUGHTSMEN,
TRANSMISSION DEPARTMENT
Vacancy No. 46/54

Draughtsmen are required in the Transmission Department at this Divisional Headquarters. Experience on the design and construction of H.V. substations or overhead transmission lines an advantage.

Salary according to experience and ability, within Grade 6 (£433/£567 per annum) or Grade 5 (£567/£671 per annum) of Schedule D of the National Joint Board Agreement.

The closing date for receipt of applications is 15 Apr., 1954.

STATION CLERK
DRAKELOW POWER STATION
Vacancy No. 52/54

Candidates should have had experience in the administrative work of a generating station including stores accounting, calculation and payment of wages and work in connection with suppliers accounts.

The salary will be within Grade 4 (£605/£665 per annum) of the National Joint Council Agreement.

The closing date for receipt of applications is 22 Apr., 1954.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(H 391)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

GENERAL ASSISTANT ENGINEER is required in the Testing Section of the Generation (Operation) Department. N.J.B. service conditions, superannuable appointment, salary within Schedule C, Grade 8, commencing in range £501 to £639, ultimately rising to £694 per annum.

Applicants should preferably have a knowledge of electronics, with experience in the use of ultrasonic instruments, and be familiar with the various forms of non-destructive testing. Appropriate technical qualifications an advantage.

Apply on form AE6, quoting Vacancy No. 639MD, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 24 Apr., 1954. (H 410)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation (Operation) Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement:

(*a*) SHIFT CHARGE ENGINEER at Nechells "A" Power Station, Grade F7, commencing at £697 per annum. (Vacancy No. 640MD.)

(*b*) JUNIOR ENGINEER at Hams Hall "A" Power Station, Grade J14, £545 per annum. (Vacancy No. 641MD.)

Applicants should have received a sound technical training and power station practical experience, in particular for (*a*) in the operation and maintenance of steam generating plant and main switchgear. Appropriate technical qualifications an advantage.

Apply on form AE6, quoting the Vacancy No., available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13 by 24 Apr., 1954. (H 411)

STAFFORDSHIRE COUNTY COUNCIL
EDUCATION COMMITTEE

APPLICATIONS are invited for ELECTRICAL ENGINEERING ASSISTANTS within the salary Grade A.P.T. I to IV (£490 to £625).

Applicants should have passed Part I of the I.E.E. Associate Membership Examination or hold equivalent qualifications and must have had experience in design and specification of electric lighting, power and heating installations for large public buildings, schools, etc.

Commencing salary will be in accordance with qualifications and experience; the appointments are permanent and superannuable subject to satisfactory medical examination and in accordance with the Service Conditions of the N.J.C.

Applications should state age, qualifications, full details of experience, present salary, present and past appointments, together with copies of two recent testimonials, and are to be received by the County Education Architect, Education Architect's Department, Green Hall, Lichfield Rd, Stafford, not later than 29 Apr., 1954.

T. H. EVANS,
Clerk of the Council.
(H 409)

A WELL-KNOWN Electrical Company has a vacancy for a SENIOR SALES ENGINEER based on their London office. The successful applicant must be a trained electrical engineer with Ordinary National Certificate as a minimum qualification and with previous experience in the London or South Eastern counties area. The post carries a responsibility for the organisation and control of three sales engineers. A generous salary is offered together with non-contributory pension scheme. — Box No. 3451, Electrical Times. (H 396)

CALCULATOR required for large Midland Industrial Undertaking. Educational requirements Engineering Degree or equivalent, knowledge of heat transfer and thermodynamics an advantage. Position permanent and pensionable. Good prospects. Age 24/32. Full details of training, experience, etc., to Chief Engineer.—Box No. 3445, Electrical Times. (H 379)

AIR MINISTRY require MECHANICAL and ELECTRICAL ENGINEERS in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (*a*) Main Grade salary scale £1,000 to £1,320, (*b*) Assistant Grade, £650 to £1,000. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Candidates should be age 25 or over. Appointments temporary and non-pensionable but with long term possibilities. Special allowance up to £1,300 a year according to location payable in addition to salary during overseas service. Candidates must be natural born British subjects of natural born British parents.

MINIMUM qualifications and experience for both grades of posts:

(i) (*a*) University degree or equivalent diploma in electrical and/or mechanical engineering and at least a two year apprenticeship or (*b*) Graduate or Corporate Membership of the Institutions of Mechanical or Electrical Engineers with appreciable electrical engineering experience and at least three years' apprenticeship, and (ii) employment in responsible position for minimum of three years with well established engineering concern providing wide experience in electrical and mechanical engineering practice.

Application forms quoting reference D1/54a from M.L. and N.S., Technical and Scientific Register (K), Almack Hse, King St, London, S.W.1. (H 135)

AGENT wanted with established connection amongst Electrical Engineering Manufacturers in Lancashire and Cheshire to handle Precision and Industrial Electrical Indicating Instruments and Testing Sets. Commission basis.—Box No. 3431, Electrical Times. (H 359)

COMMERCIAL Engineer vacancies. FUSEGEAR SALES / CONTRACTS ENGINEERS are required by The English Electric Co., Ltd., Liverpool. H.N.C. electrical and drawing office experience are essential qualifications. Write, quoting Ref. 443G to Dept. C.P.S., 336/7 Strand, W.C.2. (H 384)

C. AND J. CLARK LTD., Street, requires an electrician with experience of high frequency dielectric heating. Applications to the Personnel Department marked "Private." (H 408)

BROOKHIRST SWITCHGEAR LTD., Chester, invite applications for the position of DEVELOPMENT MANAGER. Duties will include full responsibility for the development and design of all types of electric control gear and the work of the Laboratory, Drawing Office and Workshop of the Development Department. Applicants should be professional electrical engineers who have had considerable experience in the development and design of electrical equipment, preferably in relation to control gear. This is a senior appointment carrying a good starting salary. Apply giving particulars of age, education, training and experience, and salary required to Personnel Manager, BROOKHIRST SWITCHGEAR LTD., Chester. Applications in response to earlier advertisements should not be re-submitted. (H 305)

DESIGN ENGINEER required for development of structures for Overhead Electrical Transmission Lines, Railway Electrification, Aerial Ropeways, Floodlight Towers, etc.

Successful applicant, who should have had a thorough theoretical training and practical experience in the design and application of these structures, would be expected to control and organise his own Department.

Good prospects are offered to a man of initiative and resource.—Box No. 3429, Electrical Times. (H 358)

ENGINEER required for technical service to production unit making light electromechanical devices and motors. Experience of development work and trouble-shooting desirable. London area. Write stating full particulars to—Box No. 3435, Electrical Times. (H 363)

CHIEF TRAINING and PERSONNEL OFFICER required by Group of Companies engaged in electrical and mechanical engineering manufacture. The man appointed will be required to operate from London and his duties will involve the direction and co-ordination throughout the Group of graduate, student and craft apprenticeship schemes, supervisor training and all aspects of personnel management. Applicants must have held a similar responsible appointment, previous training and experience as a qualified electrical or mechanical engineer desirable but not essential. The appointment is permanent and pensionable carrying a starting salary of between £1,300 and £1,600 per annum depending upon age and experience. Apply by letter, giving details of age, education, training, experience and present salary, to—Box 2J, E.273, A.K. Advg. Ltd., 212a Shaftesbury Ave, London, W.C.2. (H 378)

DESIGNER - DRAUGHTSMAN. First-class man required by large industrial organisation in North London area for interesting work associated with development of electrical appliances. H.N.C. standard and experience in design of light electrical appliances desirable. Excellent salary and good conditions including 5-day week and Pension Scheme. Excellent prospects for right type of applicant. Full details of age, qualifications and experience to—Box No. 3461, Electrical Times. (H 407)

DEVELOPMENT ENGINEER for Firm making telemetering and light electromechanical equipment. At least O.N.C. London area. Write giving details of experience to—Box No. 3437, Electrical Times. (H 364)

ELECTRICAL ENGINEER required for services with a Construction Company operating the Middle East. Qualifications: possession of Ordinary National Certificate essential; Higher National Certificate desirable. Applicants should have had a wide experience of surveying and construction of power net works, both overhead and underground, substation construction and distribution. Experience in the erection and commissioning of power stations and switchgear an advantage. Age 32 to 40 years. Applications to—Box No. 3459, Electrical Times. (H 406)

ELECTRICAL ENGINEER required as Manager of large and progressive Electrical Contracting organisation in Glasgow. Applicant should have thorough training in electrical contracting industry with experience in estimating and handling of contracts, staff and clientele. Some technical qualifications essential. Business connections in Glasgow an advantage. Apply, in writing, stating age, education, training and experience to—Box No. 3439, Electrical Times. (H 366)

ELECTRICAL ENGINEER required for the Electrical Department of The Expanded Metal Co., Ltd., West Hartlepool. Should have a sound practical training, drawing office experience, a knowledge of motor control gear resistor calculations, and preferably some experience of electrical heating for industrial applications.

Apply giving full details of experience, technical qualifications, age, whether married or single and salary required, to—Box No. 3421, Electrical Times. (H 321)

ELECTRICAL ENGINEERS required by the Electricity Corporation of Nigeria for Service throughout Nigeria. All candidates must have had good general experience with an Electric Supply Authority, overseas service desirable but not essential. Senior Grade must possess B.SC. OR A.M.I.E.E., salaries and allowances £980 to £1,600. Junior Grade, well experienced in lieu of academic qualifications, £980 to £1,470 according to ability. Free passages for officers and wives and allowances for children. Kit allowance £60. Furnished quarters at low rental. Application forms and general conditions of service from the Liaison Officer, THE ELECTRICITY CORPORATION OF NIGERIA, 11 Manchester Sq, London, W.1. Reference to ET/1 should be made on all applications. (H 320)

JOHNSON AND PHILLIPS LIMITED

Appointment of Chief Rubber Cable Technologist

Applications are invited for the appointment of Chief Rubber Cable Technologist to fill a vacancy which will shortly be created by retirement.

Applicants must possess extensive experience in the design and manufacture of rubber and thermophastic cables with intimate knowledge of materials and compounds.

The duties involve responsibility for all routine technical work relating to rubber cables and materials and for research and development.

Applications giving full particulars of age, education, training experience and salary required should be sent to:

Employment and Welfare Manager
Victoria Way
Charlton, S.E.7

(H 264)

DRAUGHTSMAN (Electrical) with experience in electrical wiring diagrams required by METROPOLITAN WATER BOARD on the permanent pensionable staff. Age 20 to 29. Salary scale £325/£528 per annum. Commencing salary according to age, qualifications and experience. Higher National Certificate, General School Certificate or equivalent required.

Apply in writing stating age, qualifications and experience to the Chief Engineer (Room 156) Metropolitan Water Board, New River Head, Rosebery Avenue, E.C.1, to arrive not later than 23 Apr., 1954. Canvassing disqualifies and relationship to any member, officer or employee must be disclosed. (H 385)

E·L·M·A COMPANY in London requires TWO ASSISTANTS about 25/30 years to handle lamp stock control and lamp quotations respectively. Pension Fund. 5-day week. Write giving details of age and experience to—Box No. 3427, Electrical Times. (H 351)

ENGINEERS AND PHYSICISTS required by long-established manufacturer, London, for research and development; specialised knowledge or experience of instruments, metering, electronics and electro-mechanical devices advantageous. Salary £800 upwards. Staff pension scheme; housing assistance where necessary. Write, giving full particulars education, qualifications, experience and present salary.—Box No. 3457, Electrical Times. (H 401)

ELECTRICAL DRAUGHTSMAN required for work on detail drawings, installations, etc. National Certificate qualification, preferably Higher. Age 22/25, 5-day week, Superannuation Scheme. Details of age, education and experience to Diesel Traction Chief, NORTH BRITISH LOCOMOTIVE CO., LTD., Springburn, Glasgow. (H 356)

ELECTRICAL INSTALLATION ENGINEER required by British Company in Middle East, preferably single, not over 35 years of age; should have technical qualifications and would be in charge of new Wiring Department to undertake electrical contracting work. He must have experience in a responsible capacity of high grade technical wiring contractors work and accustomed to undertaking with full responsibility the preparation of lighting and small power installation schemes with estimates. In addition to these duties he will be required to supervise the training of Sudanese wiring personnel. Emoluments will depend on age and experience, but for a single man of 30 would not be less than £1,100 per annum with a contributory Pension Scheme and furnished accommodation provided at a nominal rent of £50 per annum. Apply—Box AC 88910 Samson Clarks, 57/61 Mortimer St, London, W.1. (H 304)

HOOVER (ELECTRIC) MOTORS LTD., Cambuslang, Lanarkshire, have vacancy for ELECTRICAL MAINTENANCE FOREMAN (25-35 years). Applicants must have practical experience in electrical distribution and control gear on machine tools. Knowledge of electronics would be an advantage. Technical education to Higher National Certificate standard or equivalent. Applications should be made in writing to the Employment Officer. (H 386)

INSTRUCTOR (Electrical Trades) required for the GOVERNMENT TECHNICAL INSTITUTE, BRITISH GUIANA, on contract for three years in first instance. Salary, etc., in scale £675 rising to £950 a year. Gratuity between £140 and £202 a year. Free passages. Liberal leave on full salary. Candidates must hold appropriate C. and G. Full Technological Certificate or H.N.C. and have at least 5 years' industrial and/or teaching experience including electrical installation work.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/30229/EE. (H 403)

JUNIOR EXECUTIVES (30/35 years) required by Sales Organisation of leading Company of Electrical Engineers. Applicants must have experience in electrical industry and be capable of taking higher responsibilities. Central London. Salary £450 to £650 per annum. Pension Scheme. Write giving details of age and experience to—Box No. 3419, Electrical Times. (H 309)

JOINTER/ELECTRICAL FITTER required for Iron and Steelworks in Southern Rhodesia. Must be experienced in 11 kV Cable jointing and capable of carrying out shop repairs to switchgear. 48-hour week at 6s. 11d. per hour, plus cost of living allowance (at present £5. 10s. per month). Marriage and Children's allowance where applicable. Full particulars concerning accommodation, passage arrangements, and any further information can be obtained on application to the Secretary, RHODESIAN IRON AND STEEL COMMISSION, P.O. Redcliff, Southern Rhodesia. (H 352)

JUNIOR ENGINEERS, age 23/27, with some knowledge of the erection of lattice tower, concrete and wood pole overhead transmission lines or a technical background as a basis for quickly assimilating this knowledge. Must be willing to serve at home or overseas. Apply in writing giving full details to Staff Officer, BRITISH INSULATING CALLENDER'S CONSTRUCTION CO., LTD., 30 Leicester Sq, London, W.C.2. When writing please quote Ref. No. C/15/54. (H 398)

MECHANICAL DRAUGHTSMAN wanted for factory in West Midlands. Permanent and pensionable post, attractive working conditions. Maximum salary approximately £730 p.a. Experience of design of malleable castings an advantage. Apply giving particulars of age, qualifications and experience, to—Box No. 3443, Electrical Times. (H 375)

POWER HOUSE ENGINEER required immediately for Trafford Park Factory generating own Steam, Electric, Hydraulic and Compressed Air services. Age 30-40 years, high standard Technical training essential. Permanent position with good prospects and superannuation. Salary according to qualifications. All replies treated in confidence.—Box No. 3455, Electrical Times. (H 400)

EPRESENTATIVE. Really first class man needed for London and Home Counties by Electrical Appliance Manufacturer who products are sold mainly through Wholesalers and Electricity Boards. Preference will be given to applicant with experience in a similar capacity. Remuneration by salary and commission. The successful applicant will have to provide his own car for which generous expenses will be allowed.

Applications, which will be treated in strict confidence, must give full particulars.—Box No. 3433, Electrical Times. (H 362)

SIMPLEX ELECTRIC COMPANY LIMITED.

require an experienced

REPRESENTATIVE

for the South Midlands. Must be fully conversant with modern installation practice and able to develop the sale of the Company's products in this field. Preference will be given to an applicant who is a car owner and who is resident in the Coventry district. Applications, stating age, qualifications, and salary required, should be made to: The Secretary,

SIMPLEX ELECTRIC CO., LTD.,
Broadwell, Oldbury, Birmingham. (H 404)

REPRESENTATIVE for South Eastern Counties. Applicants should be resident on the territory. Have good contacts with architects, wholesalers and contractors, and possess their own car. This is an interesting and worthwhile post for a man with right background. Write in confidence to the Sales Manager, M.K. Electric Limited, Wakefield St, N.18. (H 413)

REPRESENTATIVES required for London Area (also one for Midlands Area) for well known Electrical Manufacturer for wholesalers and manufacturers. State particulars, salary required, etc.—Box No. 3417, Electrical Times. (H 299)

SURVEYOR required, conversant with Surveying and Profiling Overhead Line Routes. Good wages and subsistence paid. References required. Inverness, Elgin Area. Apply: B. FRENCH LTD., Pike Mills, Green St, Kidderminster. (H 289)

SHIFT-CHARGE ENGINEER required by The Steel Company of Wales Limited (Steel Division), at their Margam Power Plant.

Applicants should possess evidence of advanced technical training and have knowledge of the operational control of H.T. interconnected network, together with some experience in turbine and boiler operation.

Higher National Certificate or equivalent desirable.

Salary £750/£800 per annum according to qualifications and experience.

Candidates wishing to apply for this vacancy should write for official Application Form to the Personnel Superintendent, The Steel Company of Wales Limited, P.O. Box No. 3, Port Talbot, Glam. (H 324)

SALES ENGINEERS are required by the LANCASHIRE DYNAMO GROUP for their expanding Sales Organisation in Newcastle, Sheffield, Leeds, Manchester and Birmingham. Applicants should give general details of education, technical training, sales experience, present duties and salary level to F.H.S., The Lancashire Dynamo Group, St. Stephen's Hse, Victoria Embankment, S.W.1. (H 353)

SENIOR SALES AND CONTRACTS ENGINEERS are required by THE ENGLISH ELECTRIC CO., LTD., Stafford, for heavy rotating electrical machinery and comprehensive schemes associated with this equipment.

Also JUNIOR ENGINEERS possessing H.N.C. and sound engineering experience, preferably with a commercial bias, are invited to apply. Please write giving full details to Dept. C.P.S., 336/7 Strand, W.C.2, quoting ref. 334D. (H 365)

THE NATIONAL BOILER AND GENERAL INSURANCE CO., LTD., St. Mary's Parsonage, Manchester, 3, require ENGINEERS for appointment as Inspecting Engineer of (a) Boilers and Engines, (b) Lifts and Cranes, and (c) Electrical Plant. First-class M.O.T. Certificate of Competency and/or Higher National Certificate (Mechanical or Electrical), full apprenticeship and practical experience necessary. Apply in own handwriting, giving age (limits 26 to 33), training and experience, academic qualifications and copies of testimonials. Salary £540/£785 (progressive). Non-contributory pension scheme. (H 402)

SUNVIC CONTROLS have a vacancy at their Harlow factory for ENGINEERS with works training and experience in design of domestic control devices. Applicants should be between 25 and 35 years of age, and have B.Sc. or equivalent qualifications. Housing immediately available. Apply in writing to: Chief Engineer, Sunvic Controls Ltd., No. 1 Standard Factory, Harlow, Essex. (H 368)

TWO SALES REPRESENTATIVES, age limits 25/35, to call upon Electricity Board Showrooms and Electrical Wholesalers for the sale of Burco Electric Washing Appliances. One for South Wales, resident Newport or Cardiff locality. One for the North-East, resident in the Newcastle Area.

Applicants should submit full details as to character and experience to Burco Ltd., Rosegrove, Burnley. (H 412)

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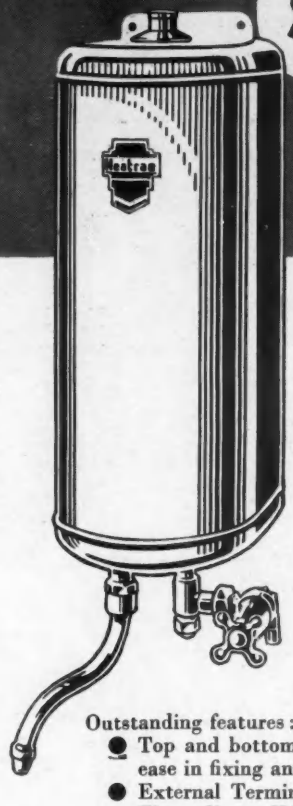

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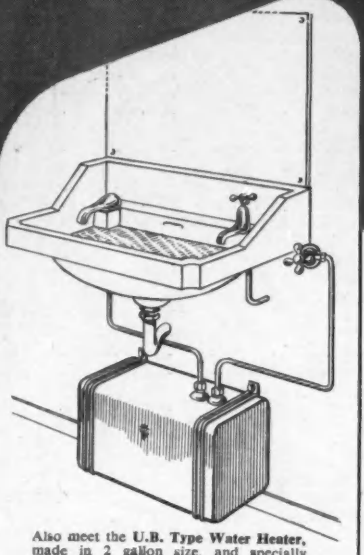

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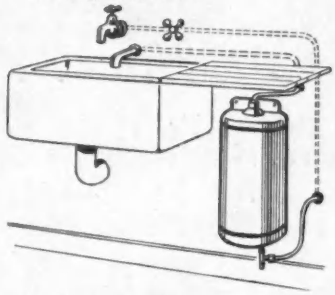

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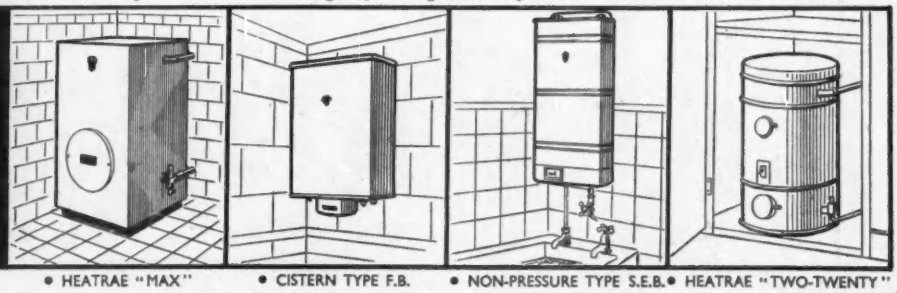

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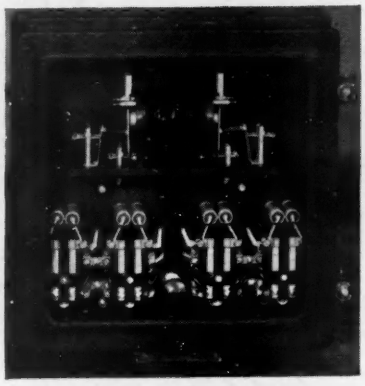

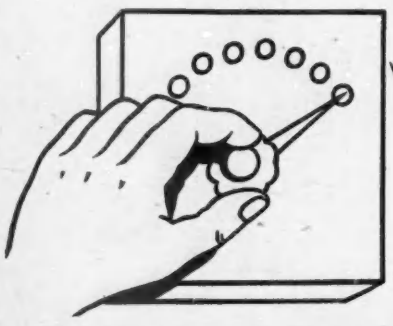

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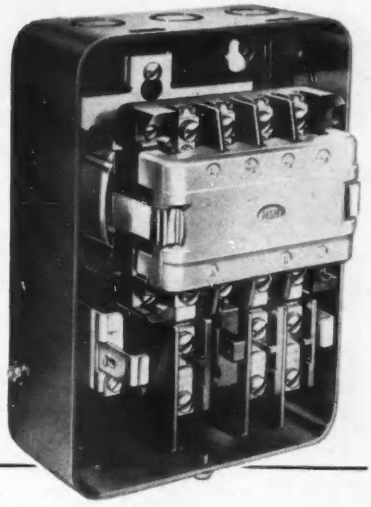

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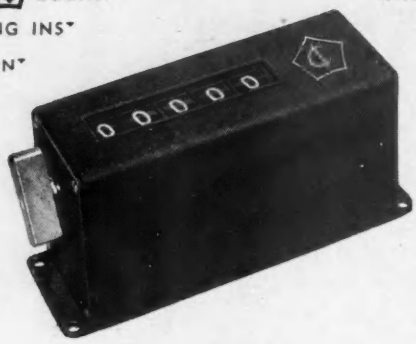

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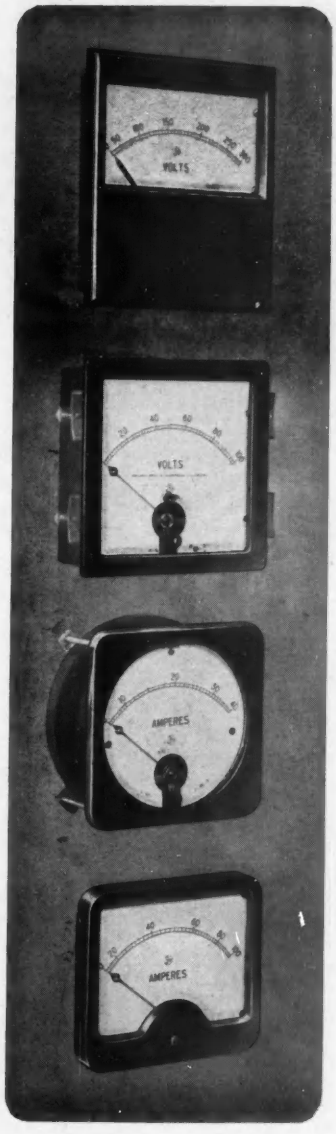

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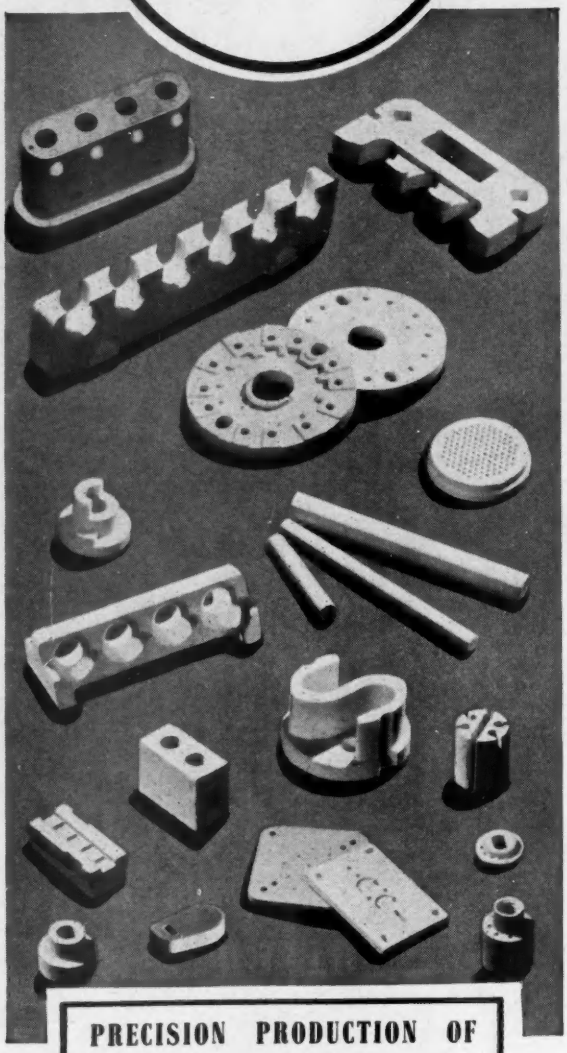

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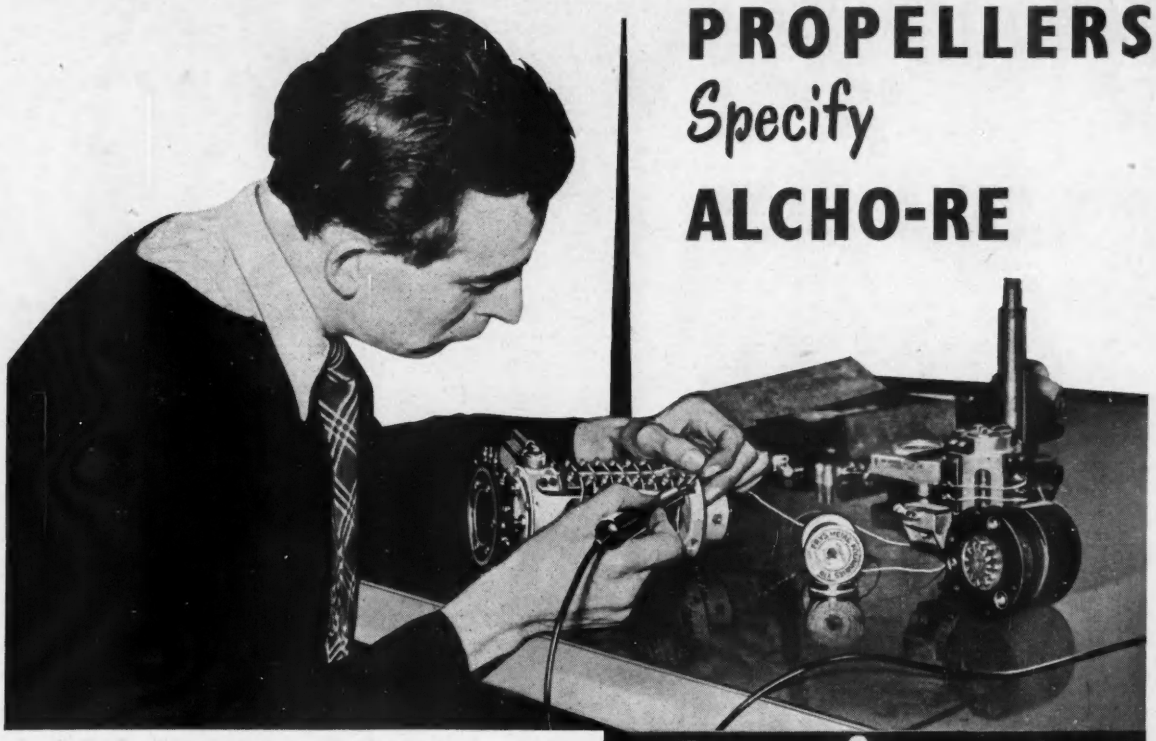

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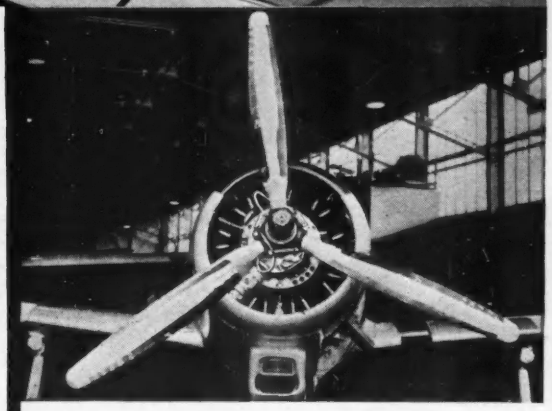

In the first picture a connection is being made between slip rings and an electrical register unit devised by de Havilland Propellers Ltd. The small picture shows details of the propeller blades as they are wired-up to record stresses in the metal of the blades in flight.

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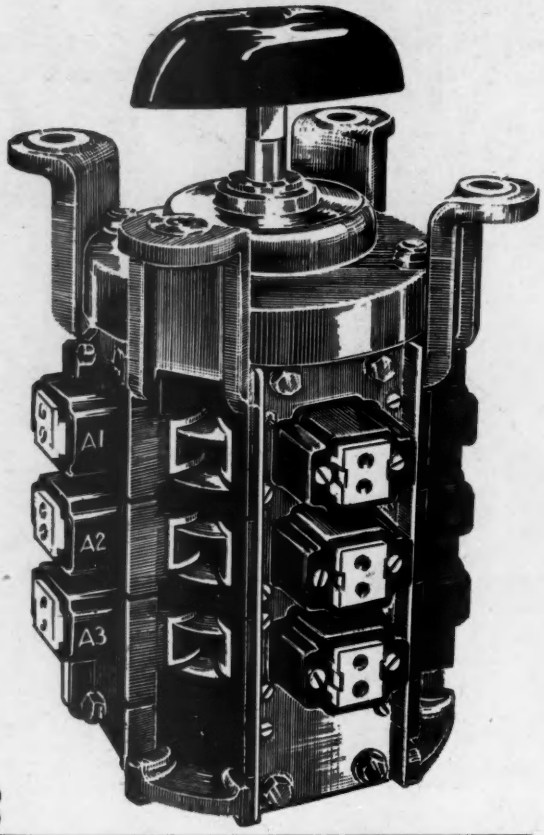

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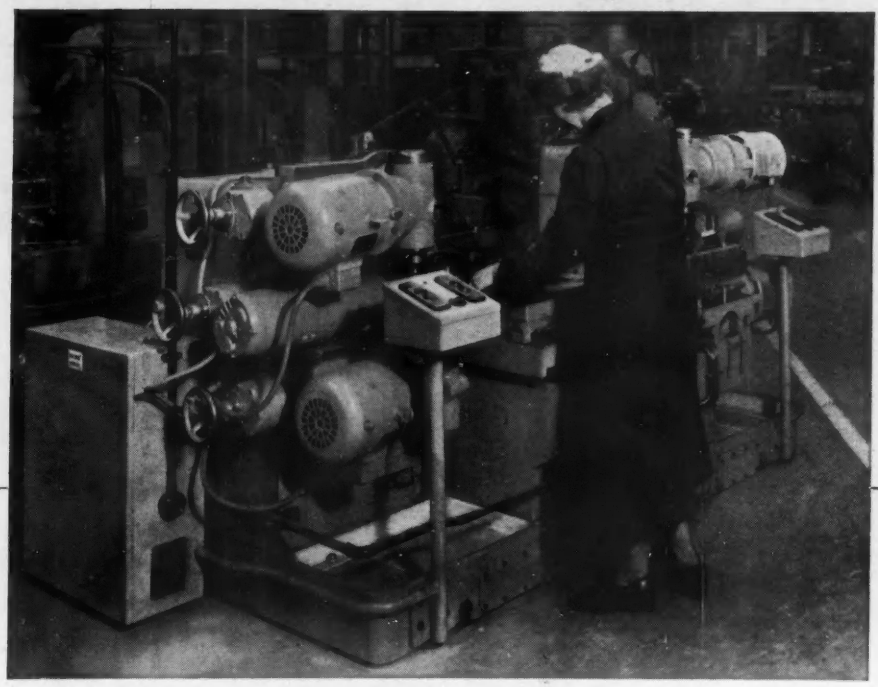

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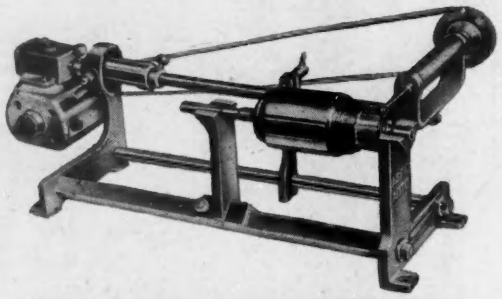

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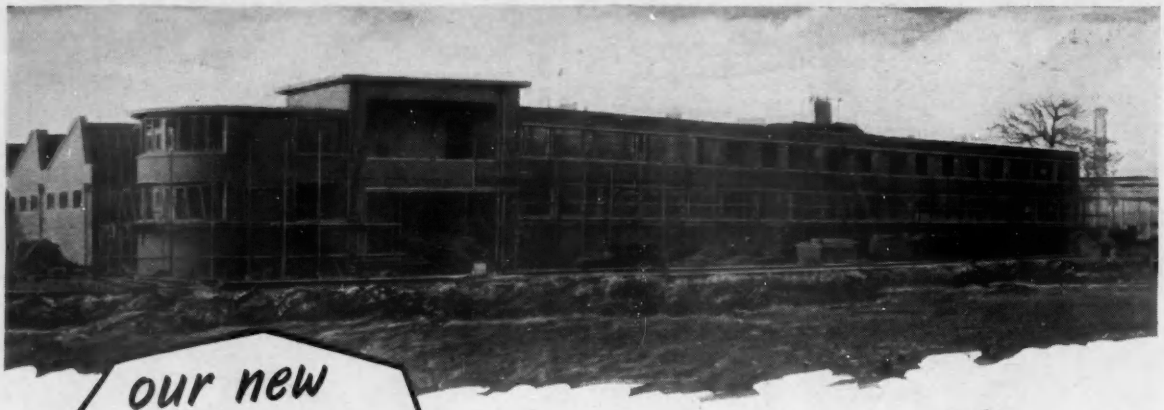

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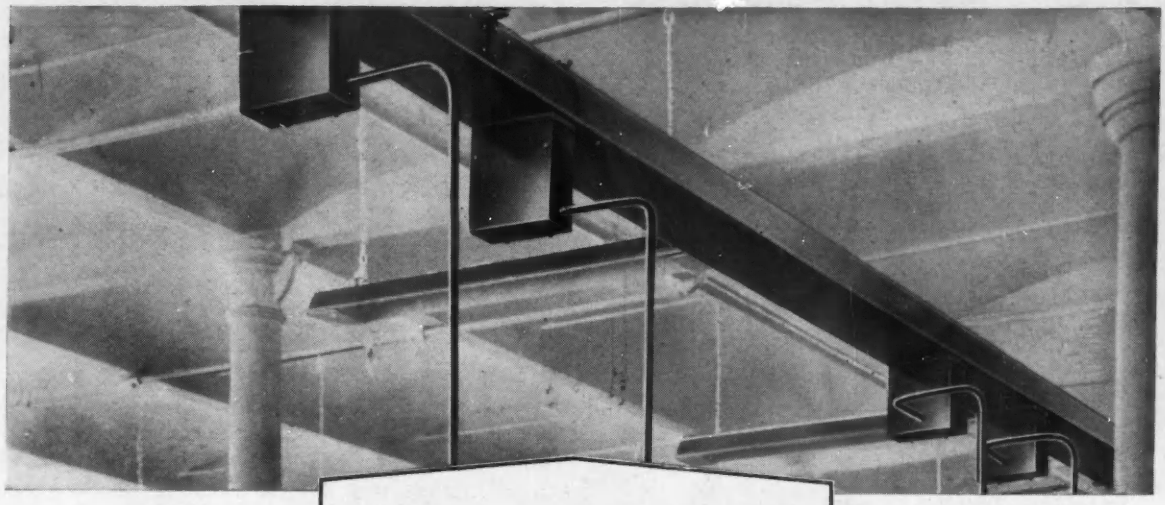

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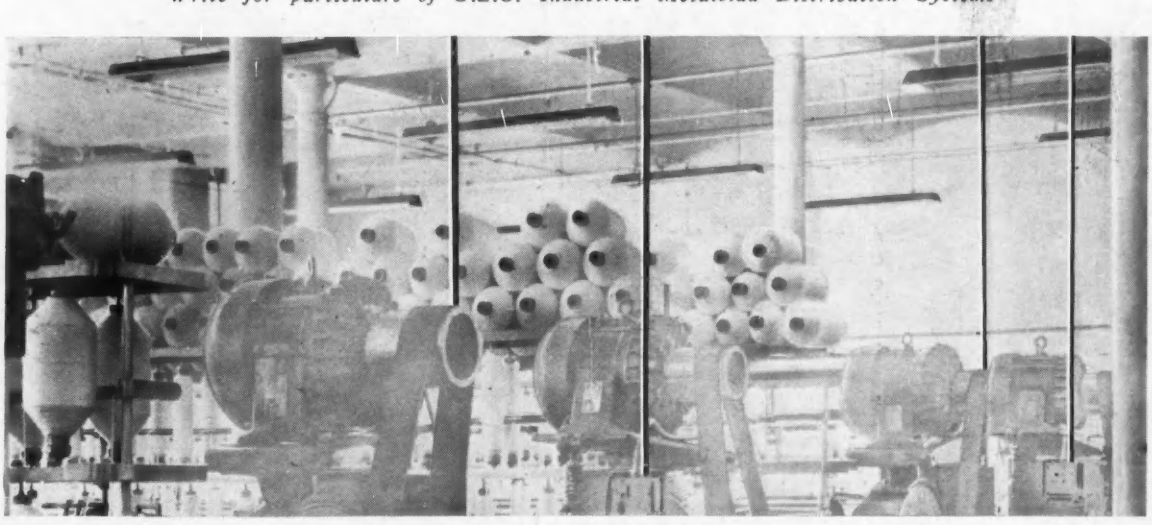

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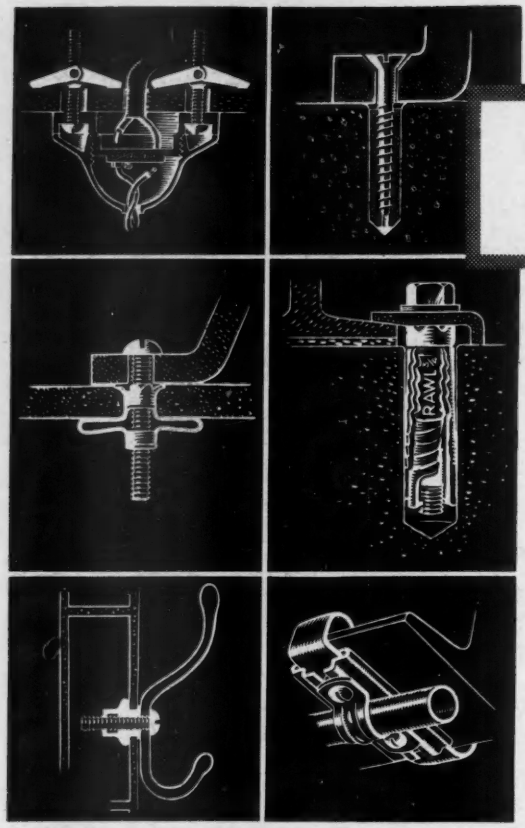

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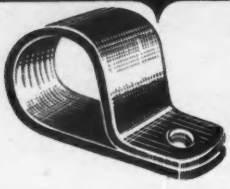

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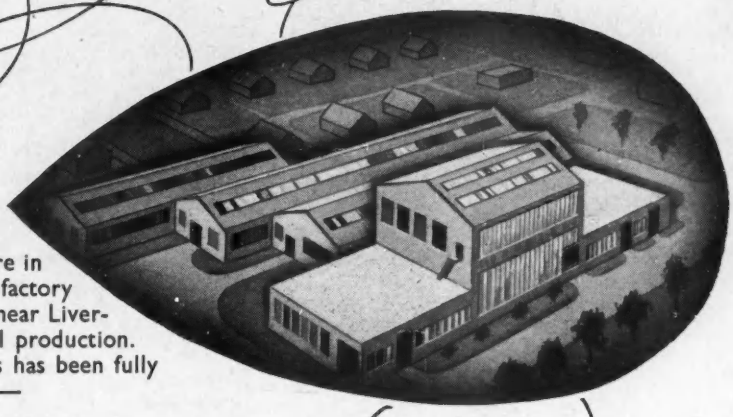

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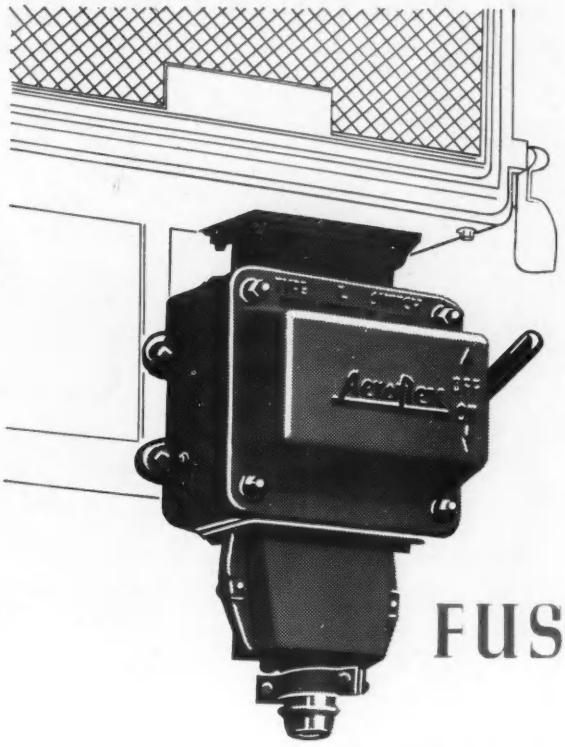

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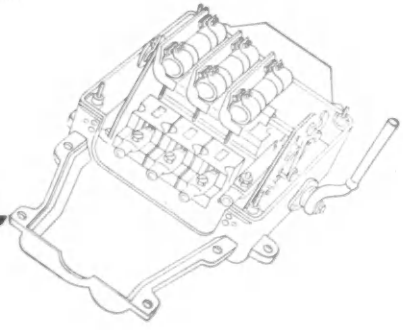

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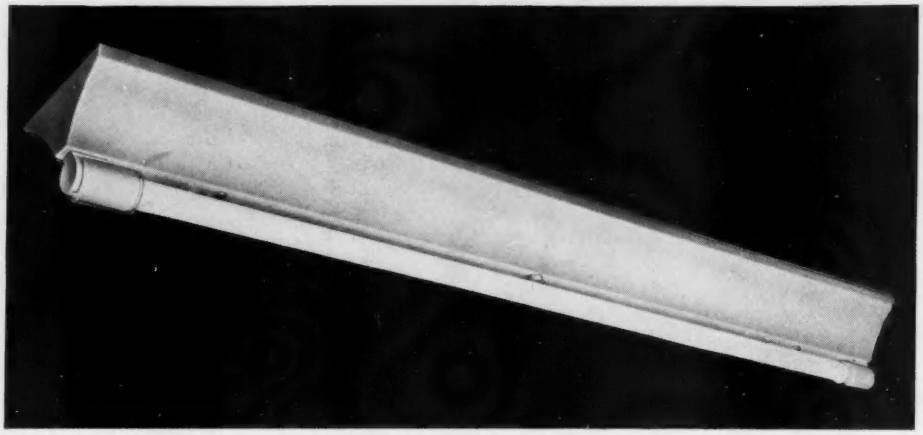

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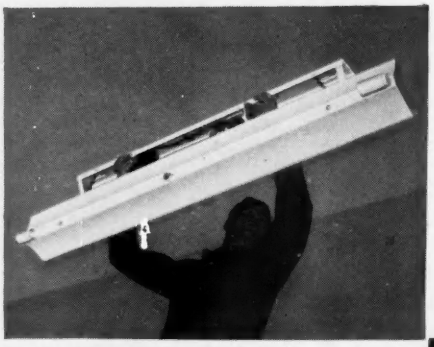

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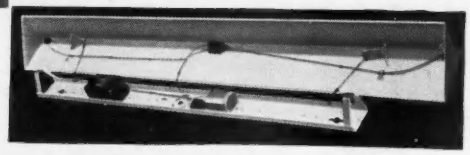

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